ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

DEPARTMENT OF ENGLISH

(GRADUATE PROGRAM)

TEXT STRUCTURE AWARENESS AS A METACOGNITIVE STRATEGY IN THE COMPREHENSION OF SCIENCE TEXTS: THE CASE OF BOKOJI PREPARATORY SCHOOL GRADE 11 NATURAL SCIENCE STREAM STUDENTS

BY

ENDALE NIGUSSIE

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ADAMA, ETHIOPIA

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DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the thesis have been duly acknowledged.

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ABSTRACT

Despite the fact that there are a significant number of research findings in the area of ESL/EFL strategic reading, metacognitive reading strategies are reported to be the least researched. Moreover, most of the existing metacognition studies themselves focused on ESL context, where English is used as an official language and/or as a medium of instruction, or where individuals can easily pick up the language due to their proximity to fluent speakers of the language. However, a number of factors, such as the nature of L1 and the socio-cultural context of the learner are known to affect her/his use of metacognitive strategies. Additionally, the study of text structure as a metacognitive strategy has been mainly confined to literary and narrative texts, more specifically to native speakers' reading comprehension and in higher education context. On top of this, there is no consensus among researchers on the significance of metacognitive instruction on students reading comprehension performance as well as recall of information from a learnt material. Above all, the reading comprehension performance of Ethiopian preparatory schools has also been reported to be continuously deteriorating. Hence, this experimental design research was conducted with the aim of investigating the effect of text structure awareness as a metacognitive strategy in the comprehension of science texts. To this end, two independent samples randomized experimental study was designed. Three instruments of data collection, namely, reading comprehension tests, metacognitive text structure awareness reading strategy questionnaire and a semi-structured interview were developed. The analysis of independent samples t-test indicated that students in the experimental group, who received metacognitive strategy awareness instruction, achieved significantly higher scores in posttest reading comprehension and knowledge retention tests than those in the control group. Additionally, a paired sample test was conducted on the participants in the experimental group and it showed a significant improvement in the group's posttest reading comprehension scores. Furthermore, a metacognitive text structure awareness reading strategy questionnaire that was administered to the students in the experimental group after the experimental intervention showed that text structure awareness level of significantly improved. The finding from the qualitative analysis of the interview also backed up the finding of the quantitative data. The current research recommends further experimentally controlled studies to investigate the online use of metacognitive strategies and real effect of these strategies on different texts, more particularly descriptive texts among EFL learners of Ethiopia. Additionally, English and science teachers at preparatory level need to collaborate on metacognitive text structure awareness instruction and material preparation to improve the academic performance of science students.

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LIST OF ABBREVIATIONS AND ACRONYMS

ESL/EFL-English as a Second or Foreign Language

ESP-English for Especial Purposes

EST-English for Science and Technology

PR-Participant Respondent

SLI- Second Language Instruction

SL-Second Language

SPSS-Software Packages for Social Sciences

TR-Teacher Researcher

TSMRSI/T-Text Structure Metacognitive Reading Strategy Instruction/Training

UNIT ONE: INTRODUCTION

This unit addresses the introductory part of the research. It includes background of the study, statement of the problem, purpose, and significance of the study, scope of the study, limitations of the study, definition of basic terms and organization of the research.

1.1 Background of the Study

The English language, which was once a language of a nation, has now gained an international impetus due to some global historical phenomena. According to Dudley-Evans and John (1997), the most significant of these phenomena was the colonial expansion and dominance of the British Empire all over the world. The second phenomenon these authors mention to have established the destiny of English language on a fertile land was the post-Second World War economic, scientific, and political dominance of the western world. This intern brought the emergency of ESP (English for Specific Purposes). Consequently, the global influence of the language has increased tremendously and is expected to increase in the future.

Now, English is the language of international diplomacy and business. It is also the language of science and technology, which many countries, including Ethiopia, have made it part of their school curriculum both as a subject and as a medium of instruction up to the tertiary level. In Ethiopia, the need to enhance English language education is the objective of the country as articulated in Education and Training Policy of 1994. However, despite the effort that has been made to improve English language skills of students at all levels, many students are not able to communicate effectively using the language (Franciscan, 2012).

The inability to use a foreign language skill as required may be observed due to various reasons. Phakiti (2003), for instance, discloses that foreign/second language reading comprehension is a highly complex, dynamic, and multi-componential since it involves a host of interactions among reader factors and text factors. Among the textual factors, text topic and context, text type and genre, text structure or organization and readability are the key factors commonly believed to influence the comprehension of a reading text (Monteanu et al, 2011; Phakit, 2006). These researchers point out that learners need to have their own repertoire of reading strategies to cope up with such challenge of text. Metacognitive strategies are claimed to have proved effective in the comprehension of variety of text types

in some EFL/ESL reading research findings (Ahmadi et al, 2013; Fatima, 2012; Iwai, 2011; O'Malley and Chamot, 1986; Phakit, 2006; Chamot, 1987).

Flavell coined the term metacognition in 1979 to refer to one's own conscious self-regulation in the process of learning and information processing. It is often thought to be 'thinking about thinking' (Livingstone, 1997). The above-mentioned researchers argue that metacognitive reading strategies should readily be available for learners for effective second language instruction so that optimal text processing and input could be attained.

Many researchers quite often note that the language of science and technology has its own salient characteristics that may deviate from the usual communicative language with which the students are familiar. As a result, ESL/EFL readers would find texts with such features daunting to understand (Kendeou, 2007; Munteanu et al, 2001). The difficulty the organization/structure of the text poses cannot be of less significance (Phakit, 2006; Diakidoy et al., 2003 & Hutchins, 1977).

Hutchins (1977, for instance, indicated that scientific texts are usually characterized by the use of linguistic and grammatical elements such as simple present tense, passive voice, and imperative verb, relative clauses, ample nominalization, and lots of cohesive devices or connectives. He further explained that science texts are usually expository in nature and many students miss the purpose of writer(s) of such texts as they consider these texts as list of facts. He suggests that grammatical and linguistic components employed in building up of text structure are worth paying attention to. In support of this, Hynes (2005) also suggests four types of linguistic elements in his meta-discourse reading model for effective strategic text structure identification and comprehension. These elements include transitional words, endophoric expressions, frame markers, and code glosses.

Metacognition researchers claim that, if such elements are thought consciously until automaticity is gained, they can play a pivotal role in helping learners to identify text structure type and consequently improve their reading comprehension performance, knowledge retention and strategy awareness (Ebrahim and Eissici, 2013; Diakidoy et al., 2013; Ahmadi et al., 2011; Renear and Palmer, 2010; Alderson and Pearson, 1984). However, Diakidoy et al, Rener and Palmer note that there are few studies on whether text structure awareness can really improve students reading comprehension performance of science texts as a metacognitive strategy, especially in English as a Foreign and Second Language context.

Although they are reported to be inadequate, research findings on strategic EFL/ESL reading indicated that the teaching of the basic features of science texts, demonstrating how these features contribute to the building of the whole text structure, and raising awareness on the type of text structures could help EFL students to better comprehend reading passages (Phakiti, 2006; Hutchinson, 1977).

Science texts have their own salient linguistic and structural features. Scientific texts can be expository, argumentative, and descriptive or at times, they could employ narration. However, science textbooks are mainly expository in nature (Hutchins, 1977; Monteanu et al, 2001). The basic purpose of those books' authors is to define terms or concepts, describe objects and phenomena, present cause-effect relationships, compare and contrast concepts and objects, list or classify facts and objects, or discuss problems with their respective solutions, etc,. However, many students perceive expository texts as narratives or list of facts, and thus, fail to understand the basic purpose intended to be conveyed by the text authors (Livingstone, 1997; Hutchins, 1977).

1.2 Statement of the Problem

Some research findings indicated that students' awareness of metacognitive reading strategies can be improved through systematically well-designed instructional procedures on the strategies (Phakiti, 2006). Conscious, deliberate, systematic, and on-going process of planning, monitoring and evaluation of awareness of text structure type and its salient features, has been reported to help students better comprehend science texts and in effect improve their academic achievement. On the contrary, some other researchers report and argue that there has been little effect of such strategy instruction (Zhang, 2007). This brings us to the conclusion by Afflerbach and et al and Livingstone who indicate the inconsistencies in the findings of the effect of metacognition. These researchers suggest that this had to be investigated by additional empirical studies in different socio-cultural and linguistic contexts.

In Ethiopia, despite the positive efforts that have been made to design English language instruction in a way that could help students to gain language skills for the understanding of content area study, it seems that many things have not been done yet in this regard. Students at preparatory level need to learn on their own as autonomous and adult learners for their upcoming academic success and life-long learning. Even though this is the objective of the current curriculum of Ethiopian Secondary Schools, as reflected in the newly-written

textbooks, both teachers and students cling to traditional method of instruction, and consequently, active learning process whereby metacognitive learning strategies could have been incorporated, has not been a practical reality in many contexts (Derebsa, 2006).

Moreover, the studies conducted by (Gebremedhin, 1993; Gessesse, 1999) cited in Abiy and Adelahu (2013) indicated that Ethiopian students' reading performance is continuously deteriorating. In support of this, Abiy and Adelahu referred to the report by the first National Assessment of Grades 10 and 12 in 2010, which revealed that in both grades 10 and 12, the mean score for English was below the minimum requirement. Accordingly, the percentages achieving 50% and above were only 17.8% for grade 10, and 25.9% for grade 12. Furtherore, it has also been reported that students do not have and cannot easily use appropriate metacognitive strategies for active learning and effective reading comprehension, especially in comprehending science texts (Sbhatu, 1998). Some related studies that have been out in Ethiopian context include the following:

A study by Sbhatu (1998) indicated that metacognitive reflection activities enabled students to perform better in 'application' and 'transfer' type tests as well as enhancing mean post-test scores. However, metacognitive reading activities were found not to yield any apparent effects on post-intervention tests.

Abiy and Adellahu examined the effect of general self-regulated language learning strategies on high school students' reading comprehension in a two groups randomized experimental design by considering metacognitive strategies, motivation strategies and cognitive strategies. Their study investigated that only cognitive strategies had significant effect on students' reading comprehension performance, $t= 0.301$, $p<0.05$.

A survey of secondary school students' metacognitive reading strategy use by Yohanes (2013) indicated that grade 9 students' strategy use was moderately correlated with their reading comprehension performance.

Mebratu (2014) conducted a two group experimental study where the students were assigned into an experimental and control group. He compared the effect of cognitive strategy instruction with the traditional instructional method on grade 11 students. However, he examined the effect of some selected cognitive reading strategies on students' reading comprehension. The study finding showed that cognitive strategy instruction resulted in better in reading comprehension test scores than the experimental group.

Ethiopian Preparatory level students need to be autonomous learners who can make use of metacognitive text comprehension strategy as a lifelong academic skill. However, the researcher conjectured from his teaching expertise that these students lack the knowledge of science text structure and how this structure is achieved. They do not seem to monitor their on-going cognitive process consciously, deliberately and systematically nor do they seem to evaluate their strategy use as well as the objective of reading in the expected way. In other words, they may not use metacognitive strategy for text type identification and comprehension. This could have significantly contributed to their less academic performance in science subjects

Therefore, it was reasonable to carry out the current research due to the fact that a) The studies that have been carried out at both local and international level on the effect of metacognitive strategies, more particularly on science text structure, were reported to be inadequate, and the existing ones emphasized L1 and ESL contexts, not EFL context. b) There was inconsistency in the findings of the studies that were carried out and this indicated the need for further empirical investigation. c) The use of metacognitive strategies could have significantly benefited some EFL/ESL learners. If the was the case, ignoring the possible effect of such strategies may leave preparatory level students at disadvantage. The purpose of the current research was, therefore, to investigate the effect of text structure awareness as a metacognitive strategy in the comprehension of science texts on Bokoji Preparatory School grade 11 natural science stream students.

1.3 Research Hypotheses and Questions

Though this study employed an experimental design, both quantitative and qualitative data were collected. Hence, research hypotheses and research question were presented concurrently to achieve the intended objectives of the study. The hypotheses were formulated to test the effect of metacognitive text structure awareness on experimental group participants': a) reading comprehension of science texts, b) knowledge retention and, c) metacognitive text structure awareness. However, in order to do this, before the experimental intervention it was hypothesized that the study groups (the experimental and control) would have no significant differences on metacognitive text structure awareness and consequently their mean scores on reading comprehension would not significantly, differ. This was done to make sure that the formed groups were almost identical and to make some actions to

improve homogeneity if not. The null and the alternative hypotheses are stated consecutively below with the rationale they were required to be tested and statistical tool used.

1. There is no a statistically significant difference between metacognitive text structure awareness of the experimental and control groups in the comprehension of science texts.

   There is a statistically significant difference between metacognitive text structure awareness of the experimental and control groups in the comprehension of science texts

2. There is no a statistically significant difference between the mean scores of the experimental and control groups on pretest reading comprehension of science texts.

   There is a statistically significant difference between the mean scores of the experimental and control groups on pretest reading comprehension of science texts.

Null hypotheses 1 and 2 were formulated to test if the experimental group and control group students are not statistically different on metacognitive text structure awareness and reading comprehension test of science texts. A two-tailed test was also used since the direction of the difference between the study groups could not be speculated without any intervention. Mann Whitney U test was used since the data gathered for this purpose tends to violate the assumption of normal distribution. In such circumferences, non-parametric test is normally recommended for the comparison of independent groups.

3. The students in the experimental group would not achieve a significantly higher mean score than those in the control group in posttest reading comprehension test due to metacognitive text structure awareness.

   The students in the experimental group would achieve a significantly higher mean score than those in the control group in posttest reading comprehension test due to metacognitive text structure awareness.

The third hypothesis test was aimed at testing whether there was a significant difference between the mean score of the experimental and the control group on science reading comprehension test due to the instruction of metacognitive text structure awareness reading strategy. The statistical tool used is Leven's independent t test for equal size groups. This was because data collected on the variable was of interval type.

4. The students in the experimental group would not achieve a significantly higher mean score than those in the control group on knowledge retention test due to metacognitive text structure awareness reading strategy instruction.

   The students in the experimental group would achieve a significantly higher mean score than those in the control group on knowledge retention test due to metacognitive text structure awareness reading strategy instruction.

The main objective of formulating this hypothesis was to test whether there would be a statistically significant difference between the experimental and control group students on knowledge retention test. The statistical tool used is Leven's independent t-test for equal size.

5. Posttest reading comprehension mean scores of experimental group would not significantly improve due to metacognitive text structure awareness.

   Posttest reading comprehension mean scores of experimental group would not significantly improve due to metacognitive text structure awareness.

The purpose of carrying out the fifth hypothesis test was to compare the pretest and posttest science reading comprehension performance of the experimental group students due to metacognitive text structure awareness reading strategy instruction. The statistical tool used is paired samples test.

6. There would be no a significant improvement in metacognitive text structure awareness of the experimental group students due to metacognitive text structure awareness instruction.

   There would be a significant improvement in metacognitive text structure awareness of the experimental group students due to metacognitive text structure awareness instruction.

The sixth research hypothesis was formulated with the purpose of testing whether metacognitive text structure awareness of the experimental group significantly improves due to the experimental intervention. The statistical tool used to test this hypothesis was Wilcoxon Sign Rank test.

Hypotheses 3-5 above were tested at p = 0.05 alpha level at one tail of the probability distribution. In line with the above stated hypotheses, the following specific research question was also formulated:

How well do students in the experimental group use meta-discourse devices to identify text structure types?

This research question was answered by the qualitative analysis of the data collected by the semi-structured interview. The main purpose of doing so was to supplement the possible research findings concerning quantitative research hypotheses (3-5).

1.4 Objective of the Study

This research was carried with the purpose of realizing the general and specific objectives stated in the two sub-sections hereunder.

1.4.1 General Objective

As stated under the statement of the problem, the general objective of this research was to investigate the effect of text structure awareness as a metacognitive reading strategy in the comprehension of science texts.

1.4.2 Specific Objectives

The above stated broad objective of the current study can be broken down into some specific and measurable objectives. Hence, his mixed research was conducted more specifically to:

1. Test if the experimental group and control group are not statistically different on metacognitive text structure awareness in the comprehension of science texts before the experimental intervention.
2. Test if the experimental group and control group are not statistically different on pretest reading comprehension of science texts.
3. Test whether a significant difference is observed between the posttest mean scores of the experimental and control group due to metacognitive text structure awareness on posttest reading comprehension test
4. Test whether a significant difference can be observed between the mean scores of the experimental and control group due to metacognitive text structure awareness on posttest knowledge retention test.

5. Investigate whether metacognitive text structure awareness significantly improves experimental group's posttest reading comprehension scores.
6. Determine whether the experimental students' metacognitive text structure awareness significantly improves due to metacognitive text structure awareness instruction.
7. Examine (indirectly) the relationship between metacognitive awareness of meta-discourse devices (connectives, frame markers, graphic and advance organizers and punctuation marks) and ability to identify text structure types in the reading comprehension of science texts.

1.5 Significance of the Study

The research may have the some significance. In the first place, it may serve as a supporting document for those who are interested infurther study in the area. Second, its main finding may partly contribute to the knowledge of theory of cognitive learning in general, and ESL/EFL strategic reading research in particular. Third, language and science teachers may use it to collaborate on how to design instructional procedures and materials so that they may be able to teach text structure awareness strategies to sciences students effectively. It may also develop EFL teachers' awareness on the use of metacognitive text structure awareness strategy for EFL reading instruction.

1.6 Scope of the Study

It would have been better if the study was carried out on a wider population and large size samples. Doing so would have made it possible to generalize the finding to a larger population. Nevertheless, the limited time and other resources do not allow materializing this. Hence, the study was confined to Bokoji Preparatory School grade 11 natural stream students in the 2015/16 academic year. The reading materials for intervention and testing on were taken only from grade 12 physics textbook emphasizing on the texts that the students in the experimental setting are unfamiliar with. Text structure awareness as a metacognitive reading strategy was also the only predictor variable used in the study.

1.7 Limitations of the Study

The process of data collection and analyses was carried out with caution for the purpose of ensuring reliability and validity of the research. However, some limitations were impossible to avoid.

First, time and other resource constraints were the main ones, in this regard. A five point Likert scale system metacognitive strategy awareness questions were constructed by the researcher depending on the understanding of the theory of the construct of metacogniton and text structure. It may not report the whole range of metacognitive reading strategy awareness. However, as optimal effort as was made to ensure the validity and reliability of the instrument by pilot study and language teachers' and experts' opinions as well as thorough review of the literature on the topic of metacognition instruction.

In addition to this, validity of the results of the study depends on the participants' honesty, willingness, and ability to respond accurately to each question. Some respondents may prefer the average response avoiding the extremes. To compensate this discrepancy, the participants received thorough instruction and encouragement by the researcher and a colleague during the administration of the questionnaire. The other limitation that was impossible to control was encountered during intervention and testing. There were some moderate irregularities during the instruction and data collection process due to participants' late coming, absence, overlapping of school programs, and material constraint.

Finally, since the study was limited to only a school and grade level, the number of participant students was also limited to 62, the value viewed as statistically viable in experiments by the theory of normal probability distribution. Consequently, caution was required when drawing conclusion not to attempt to make generalizations to all grade 11 students in the country standing on the current result of the study.

1.8 Organization of the Research Paper

This research paper is divided into five units. The first unit sets the theoretical background of the study, and discusses the statement of the problem, objectives of the study, research questions and hypotheses, significance, scope, limitation and organization of the research. The second unit presents the review of literature and related research findings. The third unit is dedicated to the presentation of the issues pertaining to the methodological procedure of the study. Under this unit, description of the target population of the study, sample size and sampling technique, research design, instruments of data collection, procedure of data collection and analysis, and statistical procedure are included.

The fourth unit deals with the presentation, analysis, and discussion of data according concurrent to research questions and hypotheses. The final and fifth unit of the study provides the summary, conclusion, and recommendation of the research.

1.9 Definition of Terms

The key terms used in his research report are operationally defined as follows:

Advance organizers- are textual features/elements that writers use to present their ideas clearly, attractively and briefly so that their intended messages could be understood easily and timely

Cognition- is knowledge of strategy, or skill, behavior that readers use while reading to comprehend a text.

Comprehension- the active process of constructing new understandings or making meaning out of a text by building relationships among the parts of the text and between the text and one's background or pre-existing knowledge

Graphic organizers- are different illustration tools such as tables and diagrams that writers or readers use to summarize their discourse

Metacognition- is conscious and deliberate process of controlling/monitoring ones' own cognitive process, over watching the weakness and strength of cognitive repertoire while reading. It is thinking about thinking.

Metacognitive instruction/training-is a systematically designed instructional/lesson approach, or program whereby learners regulate their reading process by implementing regulatory skills/strategies such as planning, monitoring and evaluation.

Metacognitive Knowledge/awareness- is deliberate and conscious or systematically planned behavior used in the reading process

Metacognitive Reading Strategies- are deliberately/consciously planned strategies by which readers assess their level and effectiveness of text comprehension

Meta-discourse devices-are connectives, code glosses, frame markers, endophoric expressions, punctuation marks, advance and graphic organizers and any other textual elements, which help a reader to better, comprehend the text

Text- a reading passage or a short paragraph with unity and coherence in which a writer organizes his or her ideas to convey the message he intends to.

Text Structure/**Organization**- refers to how the ideas in a text are interrelated to convey a message to a reader. A simply way to think about these interrelationships is to think about the questions that the text was designed to answer.

UNIT TWO: REVIEW OF RELATED LITERATURE

This unit deals with review of literature and research findings related to the current research. Major topics such as the theory of reading comprehension, metacognition and reading strategies, text structure awareness, metacognitive instruction, and related research findings are discussed in detail. The unit is divided into eight sections. The first section is about theoretical and conceptual frame work of the current study. The second section deals with discussion of the theories of EFL/ESL reading and reading comprehension. The third section deals with the theory of metacognition and EFL/ESL reading strategies while establishing link with text structure. The fourth section discusses metacognition instruction and its effects. The fifth section deals with text structure awareness. This is followed by discussion of text versus reader reading theories. The seventh and eight sections provide review of related literature and summary of the unit respectively.

2.1 Conceptual and Theoretical Framework

The concept of metacognition has been there for as long as humans have been able to reflect on their cognitive experiences. However, there is much controversy over what exactly metacognition is in the current array of reading research literature. Theoretical and pedagogical conceptualization of the term thus has long been the agenda of hot discussion (Afflerbach, et al., 2006; Livingstone, 1997). This problem in turn has further complicated the direction instructional methodology should be designed for the better understanding of the construct. Consequently, there is lack of consistence in the metacognition research findings. The existence of this problem is as obvious as one can find a number of terms used to describe the same basic phenomenon central to metacognition.

Cognitive theory strongly focuses on the link between language and thinking, and puts a great importance on the reader's ability to make appropriate choices between contextual cues and the ability to decode and comprehend a reading text (Fairbairn & Fairbairn, 2002; O'Malley & Chamot, 1986). Therefore, cognitive psychologists have theorized that a balanced approach to the teaching of reading is one that combines a text-based approach and a discourse meaning approach in such a manner that the processes involved in reading are interactive and reciprocal (Farris et al., 1988). In effect, they recommend that readers take into consideration the intention of the author as well as their own background knowledge and experiences as they approach a reading text for effective comprehension (Anthony et al.,

1989). From this theoretical perspective both the text and what the reader brings to it as part of his or her background knowledge and pre-reading experience plays a pivotal role in the comprehension process.

The widely accepted approach to reading which currently researchers have consensus on is the interactive model of reading. So based on this conceptual understanding of the skill as a process, reading comprehension can be defined as the active process of constructing new understandings or making meaning out of a text by building relationships among the parts of the text and between the text and one's background or pre-existing knowledge (Meyer & Ray, 2011 & Anderson & Pearson, 1984). It has been argued for a long that good readers are those who can build coherent mental representations of what they read by understanding different text structures, generating inferences, monitoring their understanding, and using multiple strategies to construct the intended meaning (Meyer & Ray, 2011; Diakidoy et al, 2003).

A number of researchers propose that if the knowledge of text structure (cognition), as discussed above, could be used metacognitively, i.e. purposefully and deliberately supplemented by systematic planning, monitoring and evaluation strategies whereby readers can control their thinking process (think about their thinking as it occurs), comprehension and retention can be improved however difficult a reading text may be.

2.2 Reading and Reading Comprehension

Depending on purpose and goal, the process of reading entails different meanings. Thus, the essence of reading, for whatever reason it could be, is of paramount significance. Under this section I will shortly summarize the meaning and essence, and purpose of reading as put forwarded by different scholars.

2.2.1 Reading: Meaning and Essence

Wixsdon & Peters (1984) quoted by Anthony, Pearson and Raphael (1989: 26) defined reading as, "the process of constructing meaning through the dynamic interaction among the reader’s existing knowledge, the information suggested by the written language, and the context of the reading situation." Daniel (2006) and Fairbairn & Fairbairn (2002) also back up this point. Daniel describes reading as ‘an interactive process in which the full-grown and matured readers bring to the text their elegant experiences, capabilities, aptitudes and interests; and the text in turn, permits them to expand those experiences and abilities to find a

new knowledge (pp.1)'. Fairbairn and Fairbairn argue that reading should be seen as a dialogue between the reader and the writer. The reader, thus, questions the writer and analyzes the purpose of the writer by actively engaging him or herself (Tenkerslay, 2003).

The definition of reading depends on the different models varying from decoding of symbols from a written material, relating ones background knowledge to such material to approaching it by integrating these two, which is meant for constructively and interactively making meaning from the written text (Langan, 1984). The current trend of reading research is detached far away from the decoding-only emphasis in which the readers' task is often referred to as 'passive' as discussed in Zarrati et al (2013). Now there is a paradigm shift in favor of the conceptualization of reading as an interactive process in which the reader brings to his reading prior knowledge and experiences to derive an appropriate meaning (Karbalaei, 2010; Gaddy et al, 2013). Reading as an interactive process is where the three variables, i.e., the task variable, the learner variable and the text variable meet. The definition I have adopted for purpose of discussing reading and reading comprehension in this research, therefore, reflects an interactive view of reading.

Daniel (2006) on the essence of reading writes, '*Reading exposes people to the accumulated wisdom and intelligence of human civilization.*' According to Grabe (1991) cited in Meyer and Ray(2011), reading is an essential skill and probably the most important skill for second and foreign language learners to master content in academic contexts. Reading enables ESL/EFL students to gain understanding of themselves and the world around them so that they will be able to think critically and logically, and react to what they read in the most expected way.

2.2.2 Purposes of Reading

Obviously, reading serves different purposes (Langan, 1984; Nuttal, 1982). It is, however, not the purpose of this research to discuss all the possible purposes, which I believe, will be a needless addition. Thus, what I have observed as worth emphasizing is the essence of reading and reading comprehension in academic context, more specifically in science content area.

With the emphasis currently being given to the quality instruction in science and technology, which cannot be realized without English, it should be necessary to think about ways in which EFL/ESL strategic reading instruction could contribute to the realization of this

national objective. Furthermore, due to the complex nature of science text structure, concept overloaded terminologies and jargons, grammatical difficulty, and finally students' lack of ample background knowledge which is often assumed by text writers in those texts, the degree of importance of reading and everything related it is unquestionable (Monteanu et al, 2011; Henter, 2012; Iowa, 2011; Dandapani, 2004; Fairbairn and Fairbairn, 2002; and Sbhatu, 1998).

2.2.3 Meaning and Characteristics of EFL/ESL Reading Comprehension

EFL/ESL reading comprehension is dependent on a number of psychological, linguistic, and pedagogical variables. Phakiti (2006) explicated that EFL/ESL reading comprehension is a highly complex, dynamic, and multi-componential since it involves a host of interactions among reader and textual factors. Accordingly, textual factors such as text topic and context, text type and genre, text structure or organization and readability are among the key factors commonly believed to influence the comprehension of texts.

The structure of science text, which is predominantly expository, is usually thought to be daunting to comprehend, and thus it is recommended that EFL/ESL learners of science need be taught effective strategies to cope up with such text challenge (Monteanu et al, 2011; Renear and Palmer, 2010; Tankersley, 2003; Tovani, 2000; Sbhatu, 1998)

Reading research has indicated that readers need to utilize a wide range of strategies while reading a text (Gaddy et al, 2008; Zhang, 2007; Livingstone, 1997; Antony et al, 1989; Dole and Pearson, 1988; Mann et al, 1987; O'Malley and Chamot, 1986). They argue that reading comprehension, as a process requires the readers to utilize a variety of conscious and unconscious strategies to solve their problem in order to construct meaning from written messages. One of these strategies, the metacognitive reading strategies are the most highly accepted and currently being recommended to be used in EFL/ESL reading instruction even though research findings have not conclusively and consistently reported similar effect of metacognitive strategy instruction.

Metacognitive reading strategies can be either conscious or unconscious or automatic. Accordingly, metacognitive reading strategies refer to particular, deliberate, and goal–directed mental processes or behavior, which control and modify the reader's attempts to understand reading texts (Afflerbach, et al, 2006; Livingstone, 1997).

2.3 Theory of Metacognition

Metacognition was first introduced in the works of Flavell in the mid 1970s (Afflerbach, et al, 2006; Livingstone, 1997). It is reported to be one of words frequently used in the educational psychology describing the salient characteristics of human cognition and often regarded as a difficult construct (Lories, Dardenne, & Yzerbyt, 1998) cited by Sbhatu (1998). All humans with a normal brain function are known to engage in metacognitive activities every day and it was due to this reason that metacognition attracted the interest of researchers who theorized in favor of cognitive theory (Afflerbach, et al., 2006; Livingstone, 1997). They assumed its potential contribution in improving learning outcomes as well as its role in supporting cognitive theories of learning (Georghiades, 2004) in Sbhatu (1998). Metacognition enables humans to be successful learners, and it has been associated with intelligence (Borkowski, Carr, & Pressley, 1987) cited in Livingston (1997). Meaning, categories, components, regulatory skills and other issues related to the theory and construct of metacognition will be treated in the following sub-sections under this major section.

2.3.1 Meaning

"Metacognition" is often defined as, "thinking about thinking", even though the construct is not that that much simple. Some of the several terms which are commonly associated with metacognition include metacognitive beliefs, metacognitive awareness, metacognitive experiences, metacognitive knowledge, feeling of knowing, judgment of learning, theory of mind, metamemory, metacognitive skills, executive skills, higher-order skills, metacomponents, comprehension monitoring, learning strategies, heuristic strategies, and self-regulation are (Afflerbach, et al., 2006; Sbhatu,1998; and Livingstone, 1997). These terms entail the concept of self-regulation, executive control, or some aspect of that phenomenon such as meta-memory, and in fact, they are often used interchangeably in the literature. The most commonly used definition of metacognition is, however, the knowledge (i.e. awareness) of one's cognitive processes and the efficient use of this self-awareness to self -regulate these cognitive processes (Brown, 1987) cited in Sbhatu (1998).

As pointed out by a number of researchers, metacognition refers to higher order thinking which involves active control over the cognitive processes that enhance learning. Accordingly, activities such as planning how to deal with a given learning task, controlling comprehension while reading, and evaluating progress toward the completion of a task are

all metacognitive in nature (Afflerbach, et al, 2006; Livingstone, 1997). Since metacognition is believed to play an important role in successful learning, it is frequently proposed in strategic EFL/ESL reading instruction to study metacognitive activity and development in order to understand well how students can be taught to better use their cognitive resources through metacognitive control.

According to the current understanding of the construct of metacognition, three components, 'metacognitive knowledge' (i.e. knowledge of cognition), 'metacognitive regulation' (usually called self-regulation) and 'metacognitive experiences' are reported to be frequently used by many researchers in the field (Sbhatu, 1998). According to Flavell (1979, 1987), cited by (Afflerbach, et al., 2006; Livingstone, 1997), cognition consists of both metacognitive knowledge and metacognitive experiences or regulation. Metacognitive knowledge refers to acquired knowledge about cognitive processes, knowledge that can be used to control cognitive processes, in other words. According to Flavell and other researcher after him, metacognitive knowledge itself can be further divided into three categories: knowledge of person variables, task variables and strategy variables (Phakit, 2006; Livingstone, 1997; and O'Malley and Chamot, 1986).

2.3.2 Metacognitive Knowledge

The knowledge of person variable refers to the general understanding of how human beings learn and process the information that is gathered in the effort of learning. The knowledge of one's cognitive process sometimes referred to as intra-personal knowledge is also another domain of the same variable Phakiti (2006). A typical example to explain this may be a case of a student who is aware of the benefit of always having a pen and a piece of paper. The student may not be able to focus if he is accustomed to having reflection on his comprehension, summarizing key points, connecting ideas, highlighting, or underlining and so on in the absence of these materials.

Knowledge of task variables is about the knowledge of the nature of the task and the type and level of cognitive effort that is needed to be exerted by an individual as a learner on that specific task. For example, one may be aware that two texts with different genre may require different strategies to be used or he or she may be aware of the fact that reading and comprehending a science text takes more time than it does reading and comprehending a unit from story or history. The last category of metacognitive knowledge is the knowledge about

strategy variables. It includes knowledge about both cognitive and metacognitive strategies, as well as conditional knowledge about when, why and where it is appropriate to use such strategies (Iowa, 2012; Zhang, 2007; Afflerbach, et al, 2006; Phakiti, 2006; Livingstone, 1997).

Henter (2013) citing Flavell (1979) explains that knowledge about cognition can be grouped into three factors such as declarative knowledge ("knowing that"), procedural knowledge ("knowing how"), and conditional knowledge (knowing when, where and why a person uses a particular strategy). The regulation of cognition includes planning (which is about selecting appropriate strategies and allocation of resources necessary to execute a task), monitoring (aimed at checking awareness of the understanding level and solving the activities during task completion), testing (implementing a strategy), reviewing and evaluation of strategies (assessment of the methods used, as well as of the objectives and results achieved).

2.3.3 Metacognitive Regulation

According to (Brown, 1987) cited in Sbhatu (1998) metacognitive experiences involve making use of metacognitive strategies or metacognitive regulation. Metacognitive strategies are sequential processes by which one controls his or her cognitive activities, and to ensure that a cognitive goal, for example understanding a text, has been achieved successfully. These processes help to regulate and monitor learning, and consist of planning and monitoring cognitive activities, as well as checking or evaluating the outcomes of those activities.

A typical example which the idea discussed above can be expounded by is a learner who after reading a paragraph in a text may question himself about the central idea discussed in the paragraph. The cognitive goal will be to understand the text. So, in this situation, self-questioning is as a common metacognitive comprehension monitoring strategy can be used as one reads. If one faces a difficult problem while reading, for example, he or she needs to think about and determine what strategy should be used to ensure that she meets the cognitive goal of understanding the text. He or she may decide to go back and reread the paragraph with the objective of being able to solve the problem he or she has generated. If, after re-reading through the text she can now answer the questions, she may determine that she understands the material. Thus, the metacognitive strategy of self-questioning is used to ensure that the cognitive goal of comprehension is achieved.

2.3.4 Cognitive and Metacognitive Strategies

The concept of metacognition as I tried to discuss it here, and as it is widely used in the current research literature, incorporates both knowledge and strategy components However, this conceptualization is one of the major sources of controversy in the study of metacognition and its domains (Iowa, 2012; Afflerbach, et al, 2006; Phakiti, 2006, Zhang, 2007 and Livingstone, 1997). The controversy rises from the lack of agreement to separate what is cognitive from what is metacognitive. Metacognitive and cognitive processes are in fact so closely interwoven that what may be referred to as cognitive at a situation may be found to be metacognitive at another. As Livingston puts it “Flavell himself acknowledges that metacognitive knowledge may not be different from cognitive knowledge’’ (Livingstone, 1997).

The distinction between cognitive and metacognitive strategies depends on how the information concerning cognitive processing is used. If cognitive is thinking, then metacognitive is “thinking about thinking”. In other words, this is ‘cognition about cognition’. Metacognitive strategies are high order thinking processes that are used to oversee whether one’s cognitive processes are going well and cognitive goal is achieved (Zhang, 2007; Afflerbach, et al, 2006; Phakiti, 2006; and Livingstone, 1997). Thus if metacognition is conceived as knowledge of a set of self-instructions for regulating task performance, then cognition is the vehicle of those self-instructions. These cognitive activities in turn are subject to metacognition, for instance, to ongoing monitoring and evaluation processes (Livingstone, 1997). This circular process of metacognitive and cognitive activities makes it hard to disentangle them in the assessment of metacognition.

Many metacognition researchers seem to agree on this distinctions and definitions. As many researchers point out cognitive strategies are used to achieve certain set goals of learning for example comprehending a scientific text, whereas metacognitive strategies are used to make sure the set goal is achieved. Identifying where and why a comprehension breakdown happens in the text and being aware of how this problem can be fixed is a metacognitive strategy. However, as Livingston discusses, metacognitive and cognitive strategies may also overlap in that the same strategy could be regarded as either a cognitive or a metacognitive depending on what the purpose for using that strategy may be.

Livingstone further illustrates that due to their high interdependence and intertwined nature, cognitive and metacognitive strategies should not be treated separately but rather closely at the same time if gaining of adequate picture of cognition and metacognition is required.

Knowledge (cognition) is considered to be metacognitive if it is actively used in a strategic manner to ensure certain cognitive goal is met. So if a given cognitive activity so well planned, actively monitored and its goal toward completion is evaluated for further amendment or continuation, this action by which the cognitive activity is geared to end is metacognitive strategy(Zarrati et al, 2014; Iowa, 2012; Zhang, 2007; Gaddy et al, 2008 ; Afflerbach, et al, 2006; Phakiti, 2006 and Livingstone, 1997).

2.3.5 Metacognitive Regulatory Skills

There are three metacognitive regulatory skills used in EFL/ESL reading comprehension. These will be discussed the following sections.

2.3.5.1 Planning

Planning involves the selection of appropriate strategies and the allocation of resources that affect performance. For instance, making predictions on the content and structure of a given text or associating the topic with prior knowledge or personal experience before reading in detail, strategy sequencing, and allocating time or attention selectively before beginning a reading task are examples planning strategies (Abdullah et al., 2013). Planning is, therefore, the process of thinking about and organizing the activities required to achieve a desired goal. Thus, it is a fundamental intelligent behavior, which every reader needs to acquire and develop.

2.3.5.2 Monitoring

Monitoring is a strategy used to analyze cognitive information as the process of reading goes on. The purpose of monitoring is to improve the efficiency and effectiveness of the cognitive effort under utilization in enhancing meaningful comprehension. It facilitates keeping the work on track, and helps us to know and manage cognition when things are going wrong. It has been investigated that if monitoring is performed properly, it is an invaluable tool for better controlling of cognitive processes invested to read and understand better. It is claimed by many scholars that learners need to determine whether the cognitive resources they have are sufficient and are being well used, whether the ability they have are sufficient and

suitable, and whether they are doing what they planned to do (Afflerbach, et al, 2006; Phakiti, 2006 and Livingstone, 1997).Therefore, monitoring is conscious awareness of text comprehension process.

2.3.5.3 Evaluation

Evaluation is the act of looking back to the effectiveness of regulatory processes utilized for the realization of a set cognitive goal. It involves re-evaluating personal's aims, or reading purpose and conclusions (Livingstone, 1997). Hence, evaluation is metacognitive process of comparing the actual impact of the reading process against the selected strategic plans. Three components can be identified in the process of evaluation. These are looking at what is set out or planned to do, or gain before the actual reading process, what goals and how well they have been accomplished, and how they have been accomplished.

2.4 Metacognition Instruction and its Effects

While there are several approaches to metacognitive instruction, the most effective involve providing the learner with both knowledge of cognitive processes and, and experience or practice in using both cognitive and metacognitive strategies and evaluating the outcomes of their efforts. The provision of knowledge without experience or vice versa, however, does not seem to be sufficiently support the development of metacognitive control (Livingston, 1997).

It has been reported that successful language learners know how to use reading strategies efficiently. The purposes of strategic reading instruction is, therefore, to enable learners possess general knowledge, get a specific detail, find the main idea or theme, learn, remember, delight, summarize, identify the writer's purpose or the structure used and do research (Hyland, 1990) cited by Kezerlou (2010). Concerning the importance of reading strategies, Pressley and Afflerbach (1995) identified several key strategies that were evident in the verbal protocols they reviewed, including: (a) overview before reading; (b) look for important information and pay greater attention to it; (c) relate important points to one another; (d) activate and use prior knowledge; (e) change strategies when understanding is not good; and (f) monitor understanding and take action to correct inaccuracies in comprehension.

Metacognitive instruction or training can last for a few hours to many years depending upon on the objective of the enquiry and the available time and financial resource. Testing a long

short term or long-term effect of an instructional variable may be the interest of an individual researcher (Iowa, 2012; Zhang, 2007; Afflerbach, et al, 2006; Phakiti, 2006; and Livingstone, 1997). The effects of some variables may not be immediately observable, however slow to turn effective or insignificant they may seem, they may finally prove to be important in fostering learning. A number of metacognitive strategy instruction the researcher tried to review, lasted from few days to weeks.

Many metacognitive research instructions employ on/off-line questionnaires to assess learners' metacognitive strategy use. Even though using the online strategy is preferred to the offline in assessing the purpose a researcher, argues that neither is without problem. Online strategy refers to a condition when strategy inventory questionnaire is administered to learners as they read. The offline, on the other hand, entails assessing the students' strategy use after the task of reading. As post-reading assessment appears to be easy, many researchers prefer the offline strategy to assess learners' strategy use (Khazerlou, 2012; Iowa, 2012; Karbalaie, 2010; Zhang, 2007; Afflerbach, et al, 2006; and Phakiti, 2006)

Other researchers such use talk loud protocols and more recently the eye-movement tracking to assess students' strategy use. Obviously, these strategies can better do what is I ntended. However, both require high expertise and resource. The process of sound and video recording, and encrypting and then analyzing is not as easy as simply administering questionnaire and analyzing the frequency of the observations.

Livingstone argues that metacognition is not always explicitly heard or seen during task performance. Instead, it has often to be inferred from certain cognitive activities. Cohen (1998), cited in Sbhatu (1998) in his review of studies on language learning strategies, also points out the challenges of such instruction, but states that strategy-based instruction is still possible with careful and systematic design. For instance, as doing things step-by-step may be indicative of planned behavior, or metacognition the frequency of such behavior can be analyzed in relation actual reading comprehension performance by tests (Livingstone, 1997). Therefore, even though the means by which we are able to observe and measure this step-by-step behavioral change that we can attribute to the manipulation of the independent variable is not that much easy, it can be used as strategic data gathering tool to test students metacognitive strategy use.

A study by Janzen and Stoller (1998) cited in Dole and Pearson(1988) which involved helping second-language readers to develop as expert, or more strategic, readers, through instructed practice, i.e. integration of strategic reading in second language instruction the following steps were used and proved successful: (1) choice of a text at an appropriate difficulty level, (2) selection of strategies for instruction, (3) structuring of lessons and the writing of transcripts for guiding the presentation of strategies, and (4) the adaptation of instruction to suit learner needs and reactions to in-class modeling, practice and discussion. The conclusion made here was that in second language reading pedagogy, especially for adult learners in academic ESL settings, inclusion of explicit, comprehension-fostering metacognitive strategy instruction would benefit learners.

2.5 Text Structure Awareness

The process approach to reading comprehension has been reported to have received much attention in the literature as discussed in Farris et al (1988) by citing the works of a number of authors (Anderson et al., 1985) . This was as the consequence of the advance of cognitive theory of learning, which sees the existence of strong connection between thinking and language learning and meaning comprehension. Moreover, it is due to this development that the recent research in the area of schemata theory, which is one aspect of the reading process, has resulted in a scrutiny of the importance of text structure (Farris et al., 1988). The meaning of text structure, expository text, the importance of text structure awareness, meta-discourse devices, punctuation, and advance organizers and graphic organizers will be discussed in detail.

2.5.1 Text Structure: Meaning

Text structure refers to the ways that authors organize information in it. Closely linked words to this term include text organization, top-level structure, text pattern, and main idea text (Zarrati et al., 2014). According to Anthony et al(1989), the term ‘text structure’ was used by Meyer (1984) to refer to "how the ideas in a text are interrelated to convey a message to a reader."A simply way to think about these interrelationships is to think about the questions that the text was designed to answer. For example, as in the case of expository texts, the information therein invites questions such as, what is being explained? Who or what is involved? What are the steps? According to Ornstein (1994) cited by Heydari & Mustapha (2013) the structure of the text refers to the main ideas of the text, the manner in

which information organization is achieved, as well as different textual features such as verbal and textual cues that help the writer to organize and bring unity to the text.

2.5.2 Expository Texts

Expository texts are texts that are used by the authors to give information, to explain, to describe, or to persuade (Gaddy et al., 2008; Hutchins, 1977; Moniteau et al., 2011; & Farris et al., 1988). Based on what Gaddy and others have described expository texts, it is possible to deduce that most texts with academic content are expository. Each expository text has usually got one type of structure (Heydari & Mustapha, 2013; Dymock, 2005; Meyer and Ray, 2011; Nuttal, 1982; and Cook and Meyer, 1988). Heydari and Mustapha (2013) citing Cook (1983) reason out that since expository texts present facts, theories and dates, and the information is largely unfamiliar to the readers, they seem more difficult than narrative texts and, furthermore, this unfamiliarity impedes their comprehension.

Dymock (2005) also suggests that students should be explicitly and systematically taught expository text structure awareness as many students face difficult in comprehending such text. Obviously, all texts are different to a certain extent, but depending upon the author's purpose, the topic and the genre, reading selections tend to be organized to employ a few predominant structural patterns (Anthony et al, 1989). A text is usually a combination of different text structures. The special structures that are included expository texts are main idea or sometimes referred to as topic description, cause and effect, compare-/contrast, sequencing, enumeration, classification as well as proble / solution text structures (Heydari & Mustapha, 2013).

2.5.3 Importance of Text Structure Awareness

As wide plethora of research literature exposes, it has been argued that viewing text processing as an act of promoting passive transmission of knowledge is no more acceptable (Fairbairn & Fairbairn, 2002). Meyer (1989) cited by Heydari & Mustapha (2013) students' noted that awareness of the different types of structures would help them to infer the information that is necessary to comprehend from the text. According to Grabe (2009) cited in Zarrati et al (2014), text structure awareness includes recognizing and attending to a number of discourse-signaling systems, and thus it has proved to be an fruitful reading strategy for improving reading comprehension and recall of information.

Some researchers have argued that learners' failure to recognize the organizational structure of what they are reading is not just a factor but also the main cause for the difficulty they encounter in text comprehension. This is because of the fact that such readers are not aware of cues or text signaling markers that alert them to a particular text structures type (Mayer and Ray, 2011; Dymock, 2005). According to these scholars, good readers are those who are able to utilize their knowledge of text structures to organize their recall and poor readers, on the other hand, are those who are not able to do the same thing. In Williams (2007) cited by Zarrati et al (2013) lack of awareness of structural information of texts is stated to be one of the factors contributing to comprehension difficulties.

According to Dymock (2005) and many other researchers, use of text structure to understand how the important ideas of a text are interrelated has been found to increase readers' meaning making ability. Zarratti et al (2014) also contends that content schemata and structural schema influence each other and in the process assist readers to better make meaning out of a reading text. Reader may use content to visualize the structure being used, or organize their understanding in depth using text structure awareness.

Meyer and Ray(2011) discuss that readers who use text structure can mentally examine the relationship between sentences and paragraphs by using such relationships as sequence, comparison, causation, or problem and solution. According to May and Ray the ability to acquire information from text determines the extent to which an individual can engage in independent, life-long learning. It has been reported that these readers may also use other non-text aids that vividly indicate the top-level structure of a text to minimize memory demands (Mayer and Ray, 2011; Nuttal, 1984). According to (Meyer, Young, & Bartlett, 1989) cited in Meyer & Ray (2011), these aids include templates, text structure patterns, graphic organizers, outlines, knowledge maps, or tree structures.

Identifying the structural organization of a text has also been reported to be an effective reading strategy (Farris et al, 2008). Mayer (1980), for example, found that when familiar text structures were used to disseminate conceptual information to the reader, comprehension increased. This can be using compare and contrast, sequencing, causative and other text types. Readers' ability to predict the type of text structure used by the author has been known affect how much information is retained (Meyer & Freedle, 1984; Thorndike, 1977) cited in Zarrati et al (2014). This implies the existence of strong link between the metacognitive use of text structure use and memory enhancement (Phakiti, 2006).

According some research findings the benefit of teaching students the structure strategy is that it enables them to 1) follow the logical structure of text to understand how an author organized and emphasized ideas; 2) use processes parallel to these structures to increase their own learning and thinking (e.g., comparing, finding causal relationships, looking for solutions to block causes of problems, sequencing); and 3) use these text structures to organize their own writing, such as written summaries, recalls, and essays. (Farris et al, 2008)

2.5.4 Meta-discourse Organizers

Some of the basic features of text that can be used by readers signaling the distinction among the different types of text structures are different discourse organizers, which Hyland calls 'interactive resources' (Hyland, 2005). According to Hyland, interactive resources "*are used to organize propositional information in ways that a projected target audience is likely to find coherent and convincing*" (Hyland, 2005:50).

In the case of the current research, some of Hyland's meta-discourse interactive resources were taken and modified to meet the intended purpose. Besides the list of such resources below, punctuation marks such as colon, comma, question mark and semi-colon were selected to be used in the instruction of text structure awareness since it was believed that these marks can significantly contribute to students' text identification and comprehension.

2.5.4.1 Transition and Frame markers

Adverbial phrases and conjunctions are the most important connective devices that make texts more coherent and logical and convincing if properly used. These markers help readers make connection between points in an argument (Zarrati et al, 2014). Addition markers, for example, add elements to an argument and consist of items such as and, furthermore, by the way, etc., comparison markers mark similarities (similarly, likewise, equally, in the same way, etc.) or differences (in contrast, however, but, on the contrary, etc.). Consequence relations tell the readers that a conclusion is made (thus, therefore, consequently, in conclusion, etc.) or an argument is countered (admittedly, nevertheless, anyway, in any case, of course, etc.).

These markers frame information about components of the discourse and show text boundaries, enabling readers to understand a given text. They are used to sequence parts of a text (first, then, a/b, at the same time, next), label text stages (to summarize, in sum, by way

of introduction), mark discourse goal (I argue here, my purpose is, there are several reasons why, etc.) or indicate topic shift (now let us return to, well, right, now, etc.).

2.5.4.2 Code glosses

Code glosses are what signal the writer's assumption of reader's knowledge and experience and are used to give additional information by rephrasing or explaining what has been stated to ensure the reader's understanding of writer's intended meaning (this is called, in other words, that is, this can be defined, for example, etc.,). List of the major connective devices and expressions particularly common in science text structure types such as description, problem-solution, causative, comparison , and sequencing, and which were used for the instructional purpose to the students in the experimental group is found in appendix G.

2.5.4.3 Punctuation Marks

Punctuation marks can serve different purposes. For example, they can express the degree of certainty on the part of the writer. The use of period and question mark can illustrate this point. The question mark is used in science texts to discuss controversial topics and problems. The writer may point out a problem or raise an argumentative point of view and then seek solution or alternative course of action. In argumentative and problem-solution texts, a writer can thus use comma for the purpose being discussed here.

Other important punctuation marks are the comma, semi-colon, colon, small hyphen and parenthesis. These categories of punctuation marks signal the relationship between ideas or parts in a text. Comma, for example, can be used in appositive case and relative clause to provide additional meaning to or restrict the noun antecedent from other related nouns (which stand for people, objects, animals etc.,) that may create confusion. It could also be used to list related items or events and actions in series. It is often used in description of an object or its attributes and characteristics, in classification and enumeration of ideas, items etc., in sequence of series of events, processes, and in procedures, instructions and directions in step in science texts.

Semi-colon is chiefly used in place of conjunctions. The relationship between the clauses it equates can be of compare and contrast or cause-effect type. Both colon and small hyphen can be used to rephrase a topic in a different way for the sake of clarification. Thus what are put after and before these punctuation marks in a text are equivalent. Understanding one of the sides can help to comprehend the meaning of the other part even though there may be

some degree of linguistic difficulty. Both of the punctuation marks may also be used to signal list of items that are part of or equivalent to the first stated one(s). Parenthesis is used to enclose an alternative term or concept to what has been stated first. Making the students aware of the use of these punctuation marks may help them better comprehend reading text by providing them some insight into how to identify text structure type.

2.5.5 Advance Organizers and Graphic Organizers (GO) Use

The instruction of different expository text structures is supported by the use of advance and graphic organizers, as it is widely believed that those items help the students visualize the main content in the reading text (Grabe and Jiang, 2007) and enhance information retention and recall. The effectiveness of using these graphics with science expository texts is well documented in the reading research (Sbhatu, 1998). Thus, they are recommended to be used in text structure metacognitive awareness strategic reading. Advance organizers include italics, titles, sub-titles, margin notes etc., whereas graphic organizes include tables, arrows, time series numbers, diagrams, pie charts, word web, mind/concept maps, tree diagrams, spider web and many other types.

Grabe and Jiang recommend a number of graphic organizers that fit different text structure types as students may look for these graphics before reading or use them as evaluation tools to summarize what they have read. Graphic organizers were reported to enhance students' learning by helping learners to have mental image of the information read and subsequently access or retrieve it easily when recalling is necessary (ibid). List of graphic organizers used for the instructional purpose are found in appendix.

2.6 Text versus Reader Theories

The three important models of reading comprehension that are widely recognized among language scholars are the bottom-up model, top-down model and interactive model. These models facilitate reading comprehension and help readers to figure out texts and solve their problems while reading (Eskey, 2005) cited in (Sbhatu, 1998). These models are distinguished from each other by their focus regarding how meaning is grasped from a reading material. In the case of the bottom-up model, for example, the reading process is supported by each word in the text and the learner is required to decode each word to understand the meaning. On the other hand, with the top-down model, the reading process is supported mostly by a learner's background knowledge and prior experience. In the case of

the last model of reading comprehension, the interactive model, the reading process is supported by an interaction between the text information and the learner's background knowledge as well as the interaction between different types of metacognitive reading strategies (Grabe, 2004) cited in Zarrati et al (2014).

2.7 Related Research Findings in EFL/ESL Reading

In the following part of this research review, I will try to shed light on some related current research findings on the area of metacognition research in EFL/ESL reading comprehension by emphasizing text structure awareness instruction and its effects from international and local perspectives.

2.7.1 International Perspective

Even though its conceptualization remains unsolvable, the study of metacognition has provided educational psychologists some understanding about the thinking processes involved in learning and what makes successful students different from their less successful peers (Iowa, 2011; Livingstone, 1997; Phakiti, 2006;). It also holds several implications for instructional interventions, such as teaching students how to be more aware of their learning processes and products as well as how to regulate those processes for further effective learning in EFL/ESL contexts (Karbalaei, 2010).

According to Livingstone (1997) and Afflerbach (2006), metacognition has been linked to intelligence. Accordingly, some individuals with normal intelligence were found to be more metacognitive than others when dealing with tasks that require cognitive effort and those with greater metacognitive abilities tend to be more successful in their cognitive effort. However, it was also indicated that individuals can learn how to better regulate their cognitive activities and in doing so improve their achievement. Metacognition has also been found to be strongly associated with memory boost (Gaddy et al, 2008).

Research carried out by (Oxford, 2001; Anderson, 1991; Chamot et al. 1986) as discussed in Farris et al. (1988) on metacognition, provided evidence that student awareness, or, metacognition, is correlated with students' academic success. O'Malley et al. (1985) cited in report on a study that identified appropriate learning strategies for students and demonstrated that explicit instruction in the use of the strategies significantly improved student performance. The authors concluded that the teaching of learning strategies, coupled with

the application of those strategies in a subject-area discipline, greatly enhanced student learning.

Carrell et al (1989) discussed in Meyer and Ray (2011) conducted research on two metacognitive strategies-“semantic mapping” and an ‘‘experience-text-relationship’’ method by setting up a control/ experimental design. The results of their investigation showed that metacognitive strategy training was effective in helping the experimental group improve second-language reading achievement, while the control group did not show any obvious progress. Besides, their results also indicated a close correlation between the effectiveness of the training with students’ learning style differences.

According to a research finding by Henter (2012) on university students who do not major in languages, provision of instruction for a semester on metacognitive reading strategies on selected texts in order to test the effectiveness of such metacognitive strategies in learning a foreign language resulted in enabling the students in the experimental group to achieve higher in academic scores than those who were in the control group. Furthermore, the study indicated that these strategies could be developed by students through explicit instruction.

In an experimental study carried out by Magogwe (2013) on university students to investigate their awareness of metacognitive reading strategies in English, even though some students reported to improve their metacognitive strategy use in self-reflection questionnaire, their scores lie at the bottom on comprehension achievement test list.

An experimental research which was carried out by Gaddy et al (2008) on postsecondary learners with disabilities demonstrated that students who received metacognitive awareness instruction of text structures of physical science texts for two days for 30 minutes each performed better in reading comprehension in both immediate and delayed post tests than those who were in the control group (who received traditional instruction).

In another closely related research conducted by Zarratti et al (2014) on the effect of metacognitive awareness of text structure, significant effect was tested due to the provision of instruction of such strategic text processing to the students in the experimental group. The participants in the study were 93 university students in Tehran University who were randomly assigned to experimental and control groups. From their finding the researchers concluded that metacognitive awareness of text structure and overt teaching of textual features facilitates students’ reading comprehension.

2.7.2 Local Perspective

As the studies conducted by (Gebremedhin, 1993; Gessesse, 1999) cited in Abiy and Adelahu (2013) indicate, Ethiopian students' reading performance is continuously deteriorating. In support of this claim, Abiy and Adelahu refer to the report by the first National Assessment of Grades 10 and 12 in 2010, which revealed that in both grades 10 and 12, the mean score for English was below the minimum requirement. Accordingly, the percentages achieving 50% and above were only 17.8% for grade 10, and 25.9% for grade 12.

Abiy and Adellu hypothesized that partly students' lack of responsibility; that is, their lack of self-regulated learning has contributed to the students' failure in the national examinations. They further argue that since in national examinations for both grades reading covers relatively a higher proportion next to grammar, it is evident that the activity of reading requires self- regulation because it challenges students to coordinate multiple types of thinking process.

In their study, Abiy and Adellahu examined the effect of general self-regulated language learning strategies on high school students' reading comprehension in a two group randomized experimental design without special emphasis on text structure awareness. They treated metacognitive strategies as a separate category. The other two variables they studied were motivation and cognitive strategies. They employed both qualitative and quantitative data analysis. Their study investigated that only cognitive learning strategies had significant effect on students' reading comprehension performance, $t= 0.301$, $p<0.05$.

Another research locally conducted by Sbhatu (1998) investigated the contribution of three metacognitive instructional methods, namely graphic organizers, metacognitive reflection, and metacognitive reading in learning science among primary school students (age 10-14 years). The study indicated that metacognitive reflection activities enabled students to perform better in 'application' and 'transfer' type tests as well as enhancing mean post-test scores. However, metacognitive reading activities were found not to yield any apparent effects on post-intervention tests.

A survey of secondary school students' metacognitive reading strategy use by Yohanes (2013) indicated that grade 9 students' strategy use was moderately correlated with their reading comprehension performance. Mebratu (2014) conducted a research that is related to

the current one on grade 11 students. However, he examined the effect of some selected cognitive reading strategies on students' reading comprehension. No systematic and explicit instruction on how the students should regulate their cognitive tools was deliberately provided. He designed a two group experimental study by which he compared the effect of cognitive strategy instruction with the traditional instructional method. The research finding showed that the students who were given cognitive strategy instruction performed better in reading comprehension tests than the other comparison group.

2.8 Summary of the Unit

Studies conducted on reading instruction and reading strategies (Carrell, 1985; Palincsar & Brown, 1984) as discussed in Gaddy et al(1988) indicated that non-proficient L1 and L2 readers either do not possess knowledge and skill about strategies or mainly engage in bottom-up strategies. As demonstrated by the review of the above research findings, strategy instruction with a focus on comprehension monitoring strategies can help these less skilled readers overcome their difficulties in reading. On the other hand, some other research findings by (Abiy & Adelahu, 2013; Sbhatu, 1998) and others indicated that no significant effect of metacognitive reading strategy was observed on students' reading comprehension performance. Some other researchers such as Zhang (2007) even go as far as questioning the effect of strategic reading at all.

In defense to the above research finding, some other researchers point out that other factors such as background knowledge, intelligence or the research design used may contribute to inconsistence in the findings arrived at (Phakiti, 2006; Livingstone, 1997; Antony et al., 1989; Langan, 1984; and Tankerslay, 2003). However, they strongly recommend metacognitive strategy instruction across different cultures, learner experience, educational level and text genre by careful experimental designs should be carried out (Phakiti, 2006). On top of this, L1 learning style may greatly influence learners, and if they were not taught to read metacognitively in early school years, they may fail to use metacognitive strategies Gaddy et al (2008).

A number of EFL/ESL research emphasized on the comparison of different types of structures solely as cognitive strategies. They focused on either text structure instruction or general metacognitive strategies instruction. Some components of text structure awareness such as looking for idea connection, guessing what comes next, analyzing meta-discourse or

adverbial connective and other cohesive devices were taught to students as cognitive tools, but there is no way planning which of these strategies do fit certain text type and students' purpose; there were no monitoring and evaluation strategies deliberately followed. As it is evident from the literature reviewed here, text structure can be used as a metacognitive strategy in strategy based on the style of instruction implemented and the information use.

Additionally, as (Meyer and Ray, 2011; Grabe et al, 1988) pointed out many research findings both on metacognition and text structure emphasized literary texts which are chiefly narratives. However, expository texts need more effort to comprehend than the narrative ones and thus EFL/ESL science readers should be equipped with the knowledge of such text structure and how this knowledge can be used to facilitate their learning. Therefore, these issues call for further empirical investigation whether the instruction of the main science text structures can improve students reading comprehension. This was the main purpose of the researcher when the topic of the current research was proposed.

UNIT THREE: METHOD OF THE STUDY

This unit discusses the research design employed, materials required, the target population of the study and its description, the sample size, and sampling procedure applied, , instruments used to collect data, procedures of data collection, the method of data analysis and statistical tools, pilot study and the issue of reliability of instruments of data collection, and ethical issues.

3.1 Research Design

This study employed mixed research since both quantitative and qualitative instruments of data collection and procedures of data analysis were used. Two groups' randomized experimental design with the administration of single intervention, which was instruction of metacognitive text structure awareness as a reading comprehension strategy to the experimental group was the main source of quantitative data. The independent variable was the of text structure awareness in science as a metacognitive strategy. The dependent variables were the study groups' posttest scores on reading comprehension and knowledge retention, and metacognitive text structure awareness questionnaire responses and interview responses.

3.2 Materials

Passages selected from grade 12 physics textbook, such as, electrostatic, electromagnetic induction and wave optics were used for the instructional purpose to the experimental group. The textbook was chosen since the topics raised in it best fulfil the features of science discourse and structure. Additionally, it was easier to adopt passages for comprehension test from this book than from other textbooks. The reading comprehension test was prepared on topics, such as, thermodynamics and alternating circuits that were taken from the same book. These particular topics were selected since they were relatively unfamiliar to grade 11 natural science students and thus could not be merely comprehended or recalled due to background knowledge or reading experience.

3.3 Target Population

The target populations of this research were Bokoji preparatory school grade 11 science students in 2015/2016 academic year. The school and the students were chosen by convenience sampling technique from non-probability sampling for these reasons. The reason is that the researcher had easy access to the population for the experimental

intervention. On top of this, taking larger samples from different schools would have required sufficient time and other resources, and advanced expertise on the part of the researcher and other participants. At the absence of these, sound management of the whole research process would be impossible. Besides that, it was not the purpose of the researcher to make generalization from the findings this research to other similar population at other schools. The finding of the site would be generalized to only the target population since the sample may not be representative proportion of all grade 11 natural students in Ethiopia. The students at this level were particularly selected for the following two main reasons:

Grade 12 students were busy studying for national exam and might not be available for training and / or tests that were to be given during the study.

When they join preparatory classes, many grade eleven students find science texts difficult to read, comprehend, and often under achieve in exams.

Grade 11 students were favored since they were not familiar with the topics for testing and experimental intervention and thus it was expected that they use little explicit background knowledge which could be a confounding variable to the study

3.4 Description of the Target Population

Most of the students in the target population come from rural high schools around the town of Bokoji. Their age ranges from 17-21. There were 46 girls and 141 boys in grade 11 science classes in 4 sections at the time the study was carried out. The number of this batch of students who joined preparatory this year were 7% less than their senior students who were in grade 12 in 2015/16 academic year. Additionally, the percentage of exceptionally intelligent students who had scored 10A's among this batch of students accounted only for 50% of those who had taken the exam a year before them. Nevertheless, their grades were closely packed with no much variation- around 2.91. Therefore, it could be argued that the target population was academically less competent than their immediate seniors were and there was some degree of homogeneity among the population under consideration.

3.5 Sample Size and Sampling Technique

Among the 187 students, 62 students were selected since the designed research is experimental and it could be difficult to handle a sample size more than this. Many experts in statistics also confirm that a sample size of greater or equal to 30 is possible in experimental designs (Creswell, 2003). The selected students were randomly assigned into experimental

and control group, 31 in each group. Two participants, one to the experimental and the other to the control group, were intentionally added to minimize the gap that might be created due to participants' drop out from the study. Five students were randomly selected from the experimental group for a semi-structured interview.

3.6 Instruments of Data Collection

A metacognitive text structure awareness questionnaire was one of the data collecting tools that were used before and after experimental intervention. A reading comprehension test was used as a pretest instrument to collect data before the experimental intervention. The same test was also used as the first posttest instrument of data collection. The second posttest was knowledge retention test. A semi-structured interview was also conducted with selected participants of the experimental group after the intervention. The reliability and validity issues pertaining to these instruments are discussed in section 3.11.1Detailed information on these instruments and the procedures used are given below.

3.6.1 Metacognitive Text Structure Awareness Strategy Questionnaire

In order to complete the study successfully, the researcher himself initially produced a 25-item questionnaire and then it was administered to the selected study groups: Experimental group and the Control group. The researcher designed the instrument in order to increase the assessing power of the questionnaire by combining the elements of metacognitive strategies and text strategies since he could not find such strategies that fit the objective of the study.

The questionnaire was designed to produce students' response on the three components of the strategy under investigation: planning strategies, monitoring strategies and evaluation strategies. It contained a list of sub metacognitive reading strategies classified into the above three components that readers often exploit to comprehend a text as review of related literature indicates.

The questionnaire was also used to determine if metacognitive text structure awareness and use of students in the experimental group significantly improved after the experimental intervention. The students were specifically required to indicate the frequency ranging from 'rarely' to 'always' in which they experience metacognitive text structure reading strategies in and out of classes.

3.6.2 Pretest

As the research mainly employed an experimental design, a reading comprehension test was prepared on the selected physics topics by the cooperation of physics teachers and then administered to both experimental and control groups to check the standard of the target groups in reading comprehension performance (by examining whether there was a significant mean difference between the groups' scores). It also served as a comparison tool on students' pre-post test achievement. The test contained five reading texts, each on the major text structure types: description, problem/solution, causative, comparison, and sequencing. The five texts and questions were prepared in a way they could allow the participants to use various metacognitive strategies and text structure strategies, which altogether aimed to assess text structure awareness as a metacognitive strategy. Ten (10) questions were prepared on each of the five major text structure types. In other words, the test consisted 50 items.

3.6.3 Posttests

The tests that were given after the experimental intervention were two: the posttest reading comprehension test and knowledge retention test. These tests were administered to both study groups. A paired sample t test was also computed to analyze the pretest-posttest change in performance of the students in the experimental group.

3.6.3.1 Posttest Reading Comprehension Test

The first posttest was used to test if the students in the experimental group used text structure awareness as a metacognitive strategy, improved their reading comprehension skill, and in effect significantly achieved higher mean scores than those in the control group. The same reading test that had been used as a pretest was used for this purpose.

3.6.3.2 Knowledge Retention Test

This test was prepared on the comprehension texts that were administered to both experimental and control groups as part of the pretest and posttest. They focused on the key points on those texts which were worth remembering (since they hold the central themes of those texts) and effort was also made to match each question with the type of text structures. The objective of writing these tests was to test whether the instruction of strategic reading had long lasting effect on students' memory (ability to recall important points) from the reading texts of posttests. The students were required to answer all the questions in only 10

minutes as they might have been able to use different clues from the questions or recall from their general understanding or experience of the topics if they had been given longer time. It is also recommended in the literature that memory tests should be relatively shorter in length of the items they hold unlike other comprehension tests. On top of that, the time taken to complete these kinds of tests is also short.

3.6.4 Interview

Interviewing allows access to a wide variety of information in-depth and quickly. Thus, interview questions were intended to triangulate the result of the study and fill the gap that might not be assessed by the quantitative data collecting tools. A five-item semi-structured interview was prepared for the randomly selected student interviewees who came from the experimental group.

The interview questions' responses were recorded in a note form. These responses were analyzed qualitatively using descriptive words and loose narration. The responses of those students from the instrument were checked against the answers they had provided to item number ten of the posttest reading comprehension test and metacognitive text structure awareness reading strategy questionnaire responses after the experimental intervention in order to answer the fifth research question.

3.7 Intervention Procedure

The sampled students were first given general instruction, each group separately in a program scheduled by the school in the afternoon. They received instruction on what to do, how to do and why to do what was planned. Convenient class meeting time was agreed up on and decided at different times and venue for the groups. On the next day, they filled in metacognitive text structure awareness strategy inventory questionnaire.

The groups were neither intentionally told nor were allowed to know about what the other group was doing unless they shared due to their proximity. The students in the experimental group received metcognitive text structure awareness reading strategy instruction whereas the students in the control group received the usual instruction recommended in the syllabus in the afternoon. The experimental intervention was carried on Saturdays in the morning as well as in the afternoon sessions. The students in both groups received instruction that lasted for 6 weeks for two 2 hours through per session. This instruction was provided on 12, 19, and 26 of March and on 2, 9 and 16 of April, 2016. Complete procedure for the experimental

intervention concerning the experimental group is described below. The lessons were delivered based on model of instruction or awareness stated by Winograd and Hares (1988) cited in Phakiti (2006):

1. Describing the strategy the learners are going to learn
2. Explaining why the strategy is important and reminding them about the benefit of strategy use in reading
3. Demonstrating how to use the strategy effectively by modeling strategic reading behaviors with reading tasks/activities
4. Pointing out to learners when and where a particular strategy is suitable for use and
5. Teaching them how to evaluate their successful use of the strategy

Day 1

The students were told about the general feature of science discourse. They were also told what text structure is, major types of text structure (description, problem / solution, causative, comparison and sequencing), and the frequently used signaling meta-discourse devices (adverbial connectives, conjunctions, frame markers and punctuation marks) in each text type, by using different exemplary sentences, list of discourse markers and a template lesson found in appendix I. They were also thoroughly informed how important the knowledge of text structure is to the betterment of their reading comprehension performance and science academic achievement. They received a copy of learning material on a lesson template and were encouraged to do some exercises individually. General feedback was then provided. All lessons were loosely structured and delivered beginning with introduction, presentation, practice, consolidation, scaffolding and then individualized practice.

Day 2

The lesson given on the second day was on description. After the students were reminded about text structure and its benefit in reading, a copy of reading material was distributed. They were then made to look at the title and quickly skim the texts. Following this, they were told to think about what type of text structure it was, what it was all about, and what the tasks written on the text might require. Therefore, in such a way the students were encouraged to plan their reading goals before actually reading. They also wrote down what they guessed and which text structure signaling meta-discourse markers/grammatical elements or any other clues were used to identify the type of structure.

Next, the teacher modeled reading behavior by reading aloud beginning from the topic-guessing what it could be about and what the tasks written might require and then planning what should be gained after reading, modifying strategy by which to tackle reading problems, periodically stopping, linking ideas in the text and highlighting or encircling/ underlining information on the board, pointing out where linguistic difficulty might exist, predicting what comes next as he read by using meta-discourse markers and assuring himself there was or was not understanding. The teacher also used some graphic organizers found in appendix I to summarize the main ideas in the texts.

The students tried to imitate the same strategy used by the student researcher and evaluated their reading behavior and comprehension performance against the tasks, and their predictions and reading goals. The teacher finally gave feedback on the reading tasks and summarized the lesson before leaving the students with another reading text and comprehension tasks for scaffolding purpose. They were required to read at home using the strategic reading behavior modeled during instruction; write down their reading goal, content prediction, and task expectations and evaluation on how well they did.

They were also advised to try to summarize the main ideas in the text using appropriate graphic organizers: diagrams, charts, tables, timelines, and concept maps, whichever they thought appropriate.

Day 3

General feedback was provided on the description through limited modeling on the reading text given earlier and the students evaluated their progress. Another reading text, problem/solution text was then given to the students and the same strategic reading behavior implemented in the instruction of descriptive text structure was used. After evaluation process was completed and general feedback was given the students were left with another equivalent text on problem/solution as part of their homework and practice for scaffolding.

Day 4

The students were reminded of what text structure is and how important is its intentional use in reading comprehension. They were also encouraged to think about their progress: where they proved to be good at or failed to improve and what possible course of action they should consider. Then the same process discussed above but issue specific to the type of the text, which is causative text structure type on this data was used. The teacher’s role was also intentionally decreased.

Day 5

After general feedback was provided on the previous text that was given for scaffolding purpose, another text was presented for instruction. This time it was a text on comparison text structure. The role of the teacher decreased more this time than in the previous one. The students were gradually assumed to be responsible and autonomous learners. However, important feedback and the task of reminding the three important questions posed at the beginning of this section-what, how and why were always there.

Day 6

After the task of summarizing the previous lessons, reminding the reading strategy and its benefit the last lesson was presented. It was on the fifth major text structure type: sequencing. The same teaching approach was implemented and the lesson ended with collation of students' progress repertoire. In the last few minutes, the students were required to fill in the same questionnaire they filled in before the experimental intervention carefully and honestly under the attentive supervision of the researcher if the intended objective was being fulfilled.

The first posttest, the reading comprehension test that was used as pretest as well, was administered to both groups at the same time and in the same exam session with careful supervision during the test to minimize confounding factors. After a day, both groups were tested on the some important points worth remembering from the posttest reading comprehension texts to see if there was difference in retention of knowledge between the experimental and the control groups in the absence of those reading texts. Paired test were also run for the experimental group participants to test the pretest-posttest difference on reading comprehension scores and meta-cognitive text structure strategy awareness responses. Interview questions were finally administered to the five participants in the experimental group for the purpose of examining how well metacognitive awareness of meta-discourse devices helped the participants to identify text structure type on the reading comprehension test.

3.8 Data Collection and Organization

Under this section, issues related to data collection and organization are discussed with respect to the different instruments of data collection used to carry out the study. First, the procedure of collection and organization of the data collected using the questionnaire is

discussed. This is followed by a brief discussion of the data that was collected on the pre and posttests.

3.8.1 Data from the questionnaire

Metacognitive reading strategy inventory questionnaire prepared by the researcher was administered to the target groups on the same day the general instruction was provided. The same questionnaire was also administered to the experimental group after the intervention. The frequency of responses from pre-post administered questionnaire was then counted and organized into tables. A preliminary data validation was carried out to examine the distribution of responses.

3.8.2 Data from the pretest and posttests

As the research is experimental, a pretest reading comprehension test was designed and administered in different occasions before the provision of training, just a day after administration of the questionnaire. Then, the researcher marked the papers with colleagues, collected the scores, and kept them in a semi-analyzed way into tables. After 6 weeks of the completion of the experimental intervention, posttest reading was given on the first day. The second posttest i.e. knowledge retention test was given a week later. The tests were inter-rated and then the scores were recorded for further processing.

3.9 Data Analysis and Statistical Procedure

This research is a mainly quantitative research type. However, interview items were also included to triangulate the finding of the study. The data collected from different sources was analyzed in such a way that it revealed certain implications.

First, the data related to the students' metacognitive text structure reading strategy was analyzed. The data from the questionnaire was given the initial position in the analysis because it revealed the theoretical background of reading strategies practiced and used by the learners. Then, analysis of the comparison between the pre-tests and the posttest records was made for both groups. Independent t-test was used to analyze the data and test whether difference observed between the experimental and control group was due to the metacognitive text structure reading strategy. A paired samples t test was run on the data collected from pretest and posttest reading comprehension test. Wilcoxon Sign Rank test was also carried out for metacognitive text structure awareness strategy questionnaire administered before and after the experimental intervention in the case of the experimental

group. SPSS (statistical package for social science), version 20 was used as analysis tool. The effect of the intervention was tested at 0.05 alpha level of significance. Finally, the data collected from the interview was analyzed qualitatively in loose words by stressing on the key words and expressions related to the fifth research question.

3.10 Protection of Human Subjects

A letter from the English Department/ School of Humanities and Law requesting the permission of to carry out the experiment was presented to Bokoji preparatory school. Permission and collaboration was granted from both the stuff and the school administration. Their names or any form of privacy issues would not be exposed without their agreement and they were thanked for their collaboration a head of time.

3.11 Pilot Study

Seliger and Shohamy (1990) discussed in Mulatu (2004) state that any research instrument should be tried out before it can actually be administered to the study groups. This is mainly done for the sake of securing the validity of the instruments. Thus, the questionnaire and the reading comprehension tests used in this research were tried out on a sample of 15 grade 12 students in a pilot study. Grade 12 students were purposively used to validate the internal consistency of the instruments.

The other instruments were validated by the repeated reading and editing of teachers and some selected students.

3.11.1 Purposes of Conducting the Pilot Study

The main purposes of conducting the pilot study were to check the clarity of the questions (including wording) and to determine administering procedures including the anticipated length of time for completion, data collection instruments, procedures and data analysis techniques that would be used in the main study. Moreover, it was carried out to try out the suitability of the two questionnaire and reading comprehension tests in assessing students' metacognitive strategy use.

3.11.2 Validity and Reliability of Research Instruments

During the pilot study, student respondents were requested to verbalize how they understood and interpret each question. Furthermore, they were encouraged to express any uncertainty and/or confusion or clearly observable problem they experienced while reading the questions

and the texts. Thus, the validity of the instruments used in this study was tried to be checked as much as possible so that the instruments-the questionnaire and the tests could measure what they were supposed to. The feedback obtained from the study and recommendation of teachers and co-researchers greatly helped the researcher to modify some parts of the instruments and even to ignore a stock of others.

The reliability of the instruments was also calculated using alpha cronbach and Richardson quotients. The questionnaire's reliability Cronbach alpha quotient became 0.97, which is thought to be high. The reliability quotient for pre-post reading comprehension test instrument was calculated using the formula proposed by Kuder Richardson in Brown (1996) and it was 0.65. The reliability of this test would have been higher if all the items tested similar construct.

According to Brown (1996) cited by, the reliability test is considered high if it is in range of .80-1.00, appreciable if it is from .60 to .79, moderate if it ranges from .4 to .59, low if the value ranges from .20 to .39 and negligible if it ranges from 0.00 to .19. Hence, it is possible to conclude that the questionnaire is highly reliable, whereas the pre-posttest reading tests were moderately reliable. Due to the small number of items, the reliability test value for knowledge retention test was 60. In spite of that, as the computed value shows, the test had an appreciable reliability.

UNIT FOUR: DATA ANALYSIS, RESULT, AND DISCUSSION

4.1 Data Presentation and Analysis Procedures

This unit has three main sections. Section 4.2 deals with the presentation and analysis of the quantitative data collected from the study groups before the experimental intervention using a metacognitive text structure awareness reading strategy questionnaire and pretest reading comprehension test. Section 4.3 deals with the presentation and analysis of the data that were gathered after the experimental intervention. The data collected using metacognitive text structure awareness reading strategy questionnaire that was used before the intervention, and two posttests, namely, a reading comprehension test, and a knowledge retention test are presented and analyzed consecutively. Section 4.4 deals with the analysis of the qualitative data that was collected using the semi-structured interview. Section 4.5 of the unit deals with the discussion of the findings of the study.

While presenting and analyzing data the different statistical tests that were employed in the analysis of the data are shortly introduced with the rationale of their use in connection with data validation issues. Statistical summary is presented in tabular form and histograms are used to depict the general picture of data distribution. Finally, based on figures shown in the tables, statistical report of significance is provided.

4.2 Analysis of the Quantitative Data Collected before the Experimental Intervention

In this subsection of the unit, the analysis of the data collected before the experimental intervention is presented and analyzed. The first section deals with the analysis of the data collected using metacognitive text structure awareness reading strategy questionnaire that was administered to both the experimental and the control groups. The second section is on the analysis of the pretest reading comprehension. It was hypothesized that these groups would have no significant difference on metacognitive text structure awareness strategy level or use and reading comprehension performance when on science texts. The purpose of the analysis was, therefore, to establish the homogeneity of the study groups as they were assumed to be taken from a population of little variance.

4.2.1 Metacognitive Text Structure Awareness Reading Strategy Questionnaire Analysis

Null hypothesis 1

There is no a statistically significant difference between the mean scores of the experimental and control groups on pretest reading comprehension of science texts.

As discussed in unit three of this thesis, the purpose of using the questionnaire as an instrument of data collection was to see whether there was a significant difference between the study groups before the intervention. To this end, it was also hypothesized that the students would not significantly differ from each other on metacognitive text structure reading strategy awareness when comprehending science texts.

Since the data that was collected using the instrument is ordinal type and additionally violates data assumption for independent t-test, ($p < 0.05$), a test for non-parametric data had to be chosen for the purpose of measuring groups differences and reporting the significance of the difference that might be observed due the experimental intervention. Hypothesis of no difference was tested by using Mann-Whitney U test as a statistical tool to see if there was a significant difference between the two groups of students on their metacognitive text structure awareness level. The summary for each component variable of metacognitive strategies is summarized in the subsequent tables below. Thus, planning, monitoring, and evaluation strategies were organized consecutively in Table 4.1, Table 4.2, and Table 4.3.

Table 1 Planning Strategies

N=62 *DF=60*

Planning Strategies	Study Group	Median	Mean Rank	Mean Rank Sum	Mann-Whitney U Statistic	Sig. (2-tailed) p-value
1. Using Advance Organizers	Experimental Control	3*	31.48 31.52	976 977	480	.998*
2. Previewing Reading Text	Experimental Control	3	30.97 32.03	960 993	464	. 823
3. Planning Reading Strategy	Experimental Control	4	31.32 31.68	971 982	475	.947
4. Predicting Reading Content	Experimental Control	3	31.37 31.63	973 981	477	.962
5. Setting Reading Purpose	Experimental Control	3	31.44 31.56	975 979	479	.986
6. Relating to Experience	Experimental Control	3	31.66 31.34	982 972	476	.949
7. Anticipating Task Requirement	Experimental Control	4	31.97 31.03	991 962	466	.840
8. Viewing Tasks before Reading	Experimental Control	4	31.55 31.45	978 975	479	.993

Grouping Variable: Study Groups * Equal medians $p>0.05$

Table 1 presents planning strategy variables (1-8) with indicated, median, mean rank and U statistic and p-value at two-tailed test for both experimental and control groups. As it is seen from the figures in the table, on all planning category variables there was no statistically significant difference between the study groups on their frequency responses at two-tailed test, ($p > 0.05$). Consequently, the null hypothesis of no difference was retained.

Table 2 shows Mann-Whitney U test statistic and two-tailed significance test for the experimental and control groups on monitoring category of metacognitive text structure awareness reading strategies (9-20).

Table 2 Monitoring Strategies

N=62 *Df = 60*

Monitoring Strategies	Study Groups	Median	Mean Rank	Sum of Mean Rank	Mann Whitney U	Sig. (two tailed)
9. Checking Comprehension	Experimental Control	4*	31.21 31.79	968 986	472	.903
10. Identifying Text Structure	Experimental Control	3	31.44 31.56	975 979	479	.990
11. Testing Validity of Prediction	Experimental Control	3	31.40 31.60	974 980	478	.977
12. Checking Reading Goal	Experimental Control	4	31.74 31.26	984 969	473	.944
13. Evaluating Strategy Effectiveness	Experimental Control	3	31.63 31.37	981 973	477	.954
14. Using Prior Knowledge and Experience	Experimental Control	3	31.68 31.32	982 971	475	.947
15. Fixing online Comprehension Problems	Experimental Control	3	31.87 31.13	988 965	469	.875
16. Guessing what Comes Next	Experimental Control	3	31.05 31.95	963 991	467	.844
17. Using Punctuation Marks	Experimental Control	3	31.37 31.63	973 981	477	.965
18. Using Grammatical Elements	Experimental Control	3	31.37 31.63	973 981	477	.951
19. Connecting Ideas in a Text	Experimental Control	4	31.76 31.24	985 969	473	.915
20. Using Grammar and Punctuation to Identify Text Type	Experimental Control	4	31.16 31.84	966 987	470	.895

Grouping Variable: Study Groups * Equal medians Monitoring Strategies, $p > .05$

The analysis of the responses collected from the two study groups on metacoginite text structure awareness monitoring strategies category indicated that there was no statistically

significant difference between the experimental and the control students on the strategy awareness level (Experimental median= Control median, and for all given Z, p> 0.05).

In Table 3 on the next page, the analysis of Study Groups' metacognitive text structure awareness reading strategies of evaluation category (21-25) is dealt with. There are about five variables to be in treated in this category.

Table 3 Evaluation Strategies

N=62 *Df* = 60

Evaluation Strategies	Study Groups	Median	Mean Rank	Mean Rank Sum	Mann-Whitney U	Sig. (two tailed)
21. Checking Strategy Effectiveness	Experimental Control	3*	30.73 32.27	953 997	457	.739**
22. Completing Comprehension Tasks	Experimental Control	3	31.44 31.56	975 979	479	.984
23. Self Questioning for Checking Understanding	Experimental Control	4	31.19 31.81	967 986	471	.957
24. Making Inference from Reading	Experimental Control	4	31.26 31.74	969 984	473	.930
25. Using Graphic Organizers for Summary and Understanding	Experimental Control	4	31.52 31.48	977 976	480	.994

Grouping Variable: Study Groups *Equal medians **p>0.05

Alike the other two components of metacognitive strategies treated in the first two tables, the result of the Mann Whitney U test failed to reject the proposed null hypothesis (p>0.05) for all variable in the evaluation metacognitive strategies as well. There was no a statistically significant difference between the experimental and control group on metacognitive text structure awareness reading strategies of evaluation category.

From the analysis of metacognitive text structure awareness reading strategies in all the three categories, the formulated hypothesis was retained as the data shows no statistically significant difference between the experimental and control groups. In section 4.2.2 below analysis of pretest reading comprehension test was dealt with to see if the hypothesized homogeneity of groups' variance that was implied by pretest questionnaire analysis can be reclaimed by the pretest reading comprehension test as well.

4.2.2 Pretest Reading Comprehension Test Data Analysis

Null Hypothesis 2

There is no a statistically significant difference between the mean scores of the experimental and control groups on pretest reading comprehension of science texts.

Since the proposed test for the continuous data is independent sample test, it is mandatory that some data assumptions be met. The issue of independence of observations was previously ascertained by default: none of the groups or individuals in each group had premeditated information on the contents of the pretest instruments of data collection, and there was no way by which they could share their thoughts or responses to these instruments.

The data collected on each type of text type are closely negatively or positively skewed to the extreme and had some outliers and thus violate the assumption of normal distribution as Shapiro-Wilk indicates ($p<0.05$). Furthermore, it was not the main aim of the researcher to test groups' difference on the scores from each text type separately. To this end, the sum of scores on all text types for individual participant was found to be appropriate data for independent t test. This data set met both assumptions of the homogeneity of variance and normality of distribution.

Table 4 Pretest Data

N= 62 Df= 60

Pretest Scores	Study Group		Total
	Experimental /f/	Control /f/	
19	1_a	1_a	2
20	2_a	3_a	5
21	3_a	3_a	6
22	4_a	4_a	8
23	5_a	5_a	10
24	5_a	5_a	10
25	4_a	4_a	8
26	3_a	3_a	6
27	2_a	2_a	4
28	2_a	1_a	3
N	31	31	62

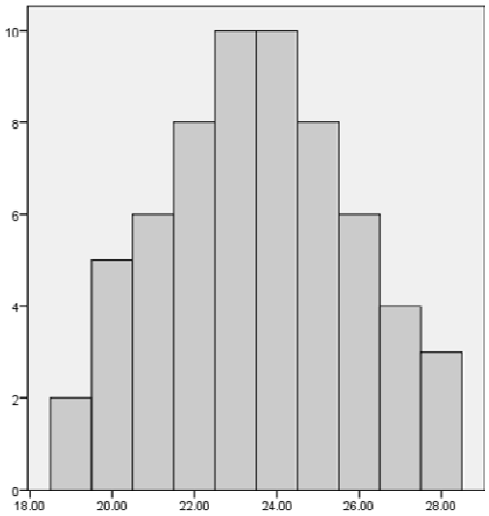
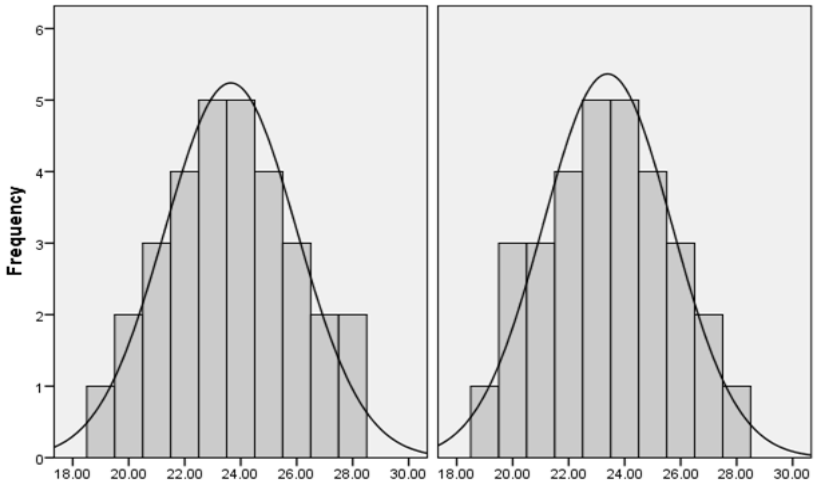


Figure 1 Histogram on Groups' pretest

For the sake of comparison, the distribution of scores for both groups is shown by the histograms (a) and (b) in fig.2.



a. Experimental Group b. Control Group

Figure 2 Experimental and Control Groups Pretest Scores

At the beginning of the undertaking of this research, it was hypothesized that the target population of the study were relatively homogeneous on the level of metacognitive text structure awareness (and hence possibly strategic use) and in effect academic reading comprehension performance. The first of these variables, namely metacognitive text structure awareness, as treated in the previous section by analyzing the data collected using the questionnaire, indicated no significant difference between the two randomly formed study groups. As to the second variable, which is the groups' pretest reading comprehension test, likewise, no different condition was expected. It was with the aim of investigating the relationship between these two variables and strengthening of the assumption of homogeneity of groups' variance that the administration of the pretest was primarily required even though the same data was also to be used to test experimental group pretest and posttest differences.

The above semi-structured data was fed into SPSS (Software Packages for Social Science) version 20 to examine the level of group difference on the mean scores achieved. Independent samples t-test was used as a statistical tool for the pretest reading comprehension test scores analysis.

Table 5 Study Groups Pretest Independent Samples Test

N=62 Df =60

Study Groups	Mean	Standard Deviation	Shapiro-Wilk Sig.	Mean Difference	T	Sig. (two tailed)
Experimental Control	23.6452 23.3871	2.36006 2.30474	.145*	.25806	.436	.665*

Grouping Variable: Study Groups *p>0.05

As the independent sample test shows, there is no a statistically significant difference between the mean scores of the experimental and control groups (Experimental Group M= 23.65, SD=2.36 and Control Group M=23.39, SD=2.30, d=0.056). Therefore, the null hypothesis was retained, p>0.05.

4.3 Posttest Data Analysis

In this section of the unit, the analysis of the posttest data collected on the sum of students' achievement scores from the reading comprehension test, knowledge retention test and metacognitive text structure awareness reading strategy questionnaire response is dealt with. Independent samples test is employed to analyze the data obtained from the first two, whereas Wilcoxon Rank Sign Test is used for the analysis of the data that was collected from the questionnaire. Additionally, a paired sample test was used to compare the pretest and posttests scores of the experimental group students on the reading comprehension test.

4.3.1 Posttest Reading Comprehension Test Data Analysis

Null Hypothesis 3

> *The students in the experimental group would not achieve a significantly higher mean score than those in the control group in posttest reading comprehension test due to metacognitive text structure awareness.*

This data was preferred since, alike the case with the pretest, the data collected on each text type violates the assumption of normal distribution to run independent t test. Besides, it is not the main purpose of this study to find out how significantly the groups vary from each other across the scores on each text type. However, the overall sum data from all text types is moderately normal (Shapiro-Wilk test p = 0.059 > 0.05). There is relatively equal distribution of scores above and below the mean score for the study groups: Experimental and control groups. Additionally, Leven's variance homogeneity test is met (p>0.05). The

data collected on this test is shown in Table 6. For the the illustration of the general picture of the distribution of the students' scores

Table 6 Study Groups' Posttest Scores

Scores	Experimental	Control /f/	Total
20.00	0	2	2
21.00	0	2	2
22.00	0	3	3
23.00	0	4	4
24.00	0	4	4
25.00	0	4	4
26.00	0	4	4
27.00	0	4	4
28.00	0	3	3
29.00	1	0	1
30.00	3	0	3
31.00	4	0	4
32.00	5	0	5
33.00	4	0	4
34.00	3	0	3
35.00	3	0	3
36.00	3	0	3
37.00	2	0	2
38.00	1	0	1
39.00	1	0	1
N	30	30	60

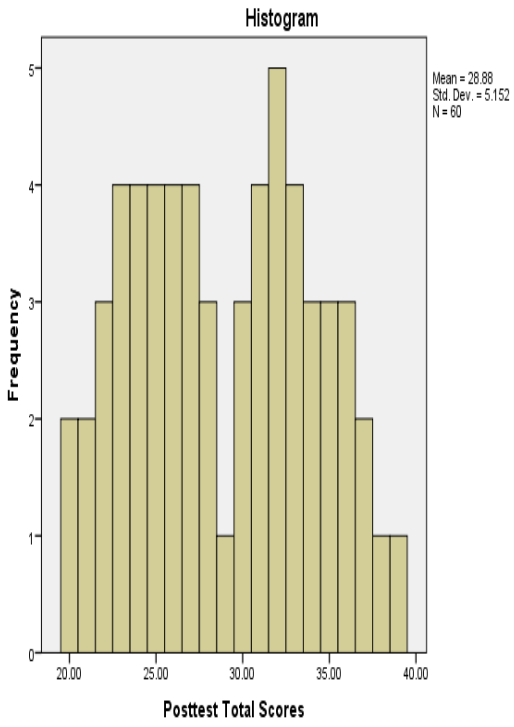


Figure 3 Histogram on Study Groups Posttest

Leven's test output for the homogeneity of variance and difference of means for the experimental and control groups on posttest reading comprehension test scores were summarized with significance level in Table 7.

This hypothesis test was aimed at testing whether there was a significant difference between the mean score of the experimental and the control group due to the teaching of metacognitive text structure awareness reading strategy. The statistical tool used is Leven's independent t-test for equal size.

Table 7 Study Groups' Posttest Independent t test

N=60 DF=58

Study Groups	Shapiro-Wilk Sig.	Mean	Standard Deviation	Mean Difference	T	Sig. (one tailed)
Experimental Control	.059** 	33.3667 24.4000	2.59287 2.38675	8.96667	13.934	.001*

Grouping Variable: Study Groups *p < 0.05 **p > 0.05

As it can be seen from the above table, a significant difference was observed between the study groups, Experimental Group (*M*= 33.37, *SD*=2.59), and Control Group (*M*= 24.40 and *SD*=2.39), t (58) =13.94, p < 0.001, d=3.6. The null hypothesis, which that the students in the experimental group would not achieve significantly higher mean scores than those in the control group in posttest reading comprehension test due to provision of metacognitive text structure awareness reading strategy instruction was, thus, rejected in favor of the alternative hypothesis which assumes a directional difference (improvement of experimental group scores).

The students in the experimental group would achieve a significantly higher mean score than those in the control group in posttest reading comprehension test due to metacognitive text structure awareness.

4.3.2 Reading Comprehension Paired Test Analysis

Null Hypothesis 4

There would be no a significant improvement in metacognitive text structure awareness of the experimental group students due to metacognitive text structure awareness instruction.

A paired test was additionally run to examine the pre-post test achievement difference for the experimental group with the intention of testing the significance of the effect of metacognitive text structure awareness reading strategy training. To do so, a pretest and posttest test achievement for the group was arranged in such a way that could be convenient for the purpose of running the test. Shapiro-Wilk normality test showed that the data from both tests was normally distributed (pretest=.706, and posttest =.392, p> 0.05).

Table 8 Experimental Group Pretest and Posttest Score

Scores	Pre test	Post Test	Total
19	1_a	0_a	1
20	2_a	0_a	2
21	2_a	0_a	2
22	4_a	0_b	4
23	5_a	0_b	5
24	5_a	0_b	5
25	4_a	0_b	4
26	3_a	0_a	3
27	2_a	0_a	2
28	2_a	0_a	2
29	0_a	1_a	1
30	0_a	3_a	3
31	0_a	4_b	4
32	0_a	5_b	5
33	0_a	4_b	4
34	0_a	3_a	3
35	0_a	3_a	3
36	0_a	3_a	3
37	0_a	2_a	2
38	0_a	1_a	1
39	0_a	1_a	1
N	30	30	60

Fig. a Fig. b

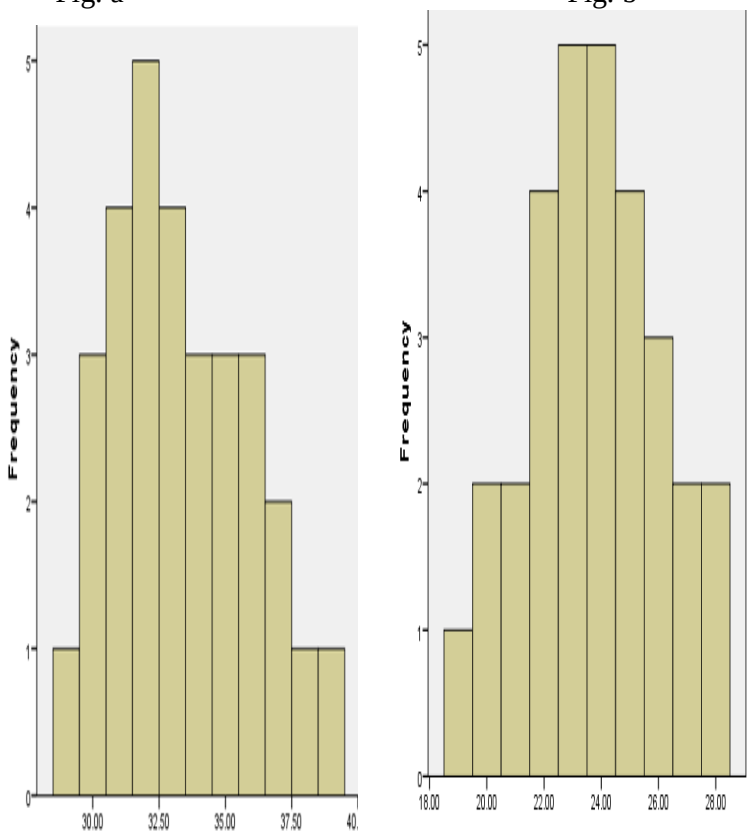


Figure 4 Histograms showing (a) pretest and (b) Posttest for Experimental Group

The general picture of pretest and posttest data distribution is shown by histograms a) and b) above. As it can be seen from the histograms, the data has moderately normal distribution. The null and alternative hypotheses are stated as follows:

Table 9 Experimental Group Paired Test

N= 30 *DF=29*

Experimental Group	N	Shapiro Wilk p value	Mean	SD	Pearson r	Mean Difference	SD	t	Sig. (1-tailed)
Pretest-posttest	30	.706** .392**	23.7333 33.3667	2.35 2.59	.963**	-9.6333	.7184	73.45	0.005*

Pretest-posttest *p< 0.01 **p>0.05

A paired-samples t-test was conducted to compare experimental group pretest and posttest scores. The result of the analysis indicated that there was a statistically significant difference between the mean scores of pretest (M=23.73, SD=2.35) and posttest (33.37, SD=2.59), t (58) = -73.45, $p < 0.05$, d=3.9. Depending on the result of the analysis, the null hypothesis was rejected and the alternative hypothesis that assumes significant difference was supported. There would be a significant improvement in metacognitive text structure awareness of the experimental group students due to metacognitive text structure awareness instruction.

4.3.3 Knowledge Retention Test Data Analysis

Null Hypothesis 5

The students in the experimental group would not achieve a significantly higher mean score than those in the control group on knowledge retention test due to metacognitive text structure awareness reading strategy instruction.

As Shapiro-Wilk data normality test indicated, the data collected from the experimental and control groups for the purpose of testing whether metacognitive text structure awareness reading strategy training can help students to have better retention and recall of information, was highly normal ($p=.963 > 0.05$). Furthermore, the histogram in Fig. 5 similarly displays a relatively normal distribution of data for both study groups. As to the homogeneity of variance, the output from Leven's test indicates the p-value of 0.566, which is greater than the set critical alpha value 0.05.

The data collected from the posttest knowledge retention test is presented in table 8. The histogram in (Fig.5) is used to depict the normality of data distribution indicated by Shapiro-Wilk test. After the task of data validation for assumption of homogeneity of variance and normality of distribution, independent t test was executed. The summary of required statistical output from Leven's test is summarized in table 11.

Table 10 Knowledge Retention Test Scores

Scores	Experimental Group		Control Group	
	F	Total	F	Total
00	0	0	4	0
1.00	0	0	6	6
2.00	2	4	7	14
3.00	5	15	6	18
4.00	6	24	4	16
5.00	6	30	3	20
6.00	5	30	0	0
7.00	3	21	0	0
8.00	3	24	0	0
Total	30	148	30	74

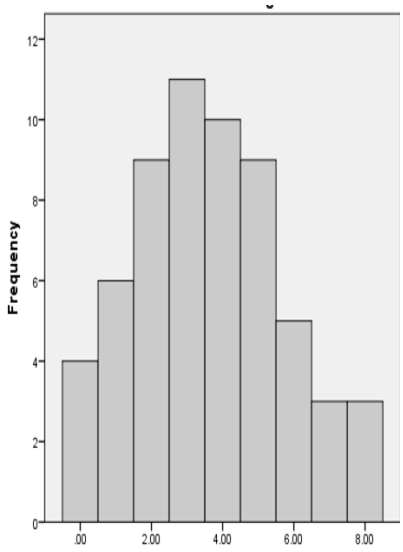


Figure 5 Histogram on Knowledge Retention

Table 11 Knowledge Retention Independent Samples t Test

N=60 *DF=57*

Study Groups	Mean	Standard Deviation	Shapiro-Wilk Sig.	Mean Difference	t	Sig. (one tailed)
Experimental	4.9333	1.74066	.145**	2.63	6.22	.001*
Control	2.3000	1.53466				

*p<0.05 ** p> 0.05

As the result of the analysis indicates here, a significant mean difference was observed between the experimental group (M=4.93, SD=1.74) and control group (M=2.30, SD=1.53), t (57) =6.22, p<0.05, d=1.94 at one-tailed test. Thus, the data analysis in the table above shows a significant difference between the pretest and posttest scores for the experimental. Therefore, the null hypothesis which stated that the students in the experimental group would not achieve significantly higher mean scores than those in the control group in knowledge retention test on science texts due to provision of metacognitive text structure awareness reading strategy instruction was rejected.

The students in the experimental group would achieve a significantly higher mean score than those in the control group on knowledge retention test due to metacognitive text structure awareness reading strategy instruction.

4.3.4 Paired-Test Metacognitive Text Structure Awareness Reading Strategy Questionnaire Analysis

Null Hypothesis 6

There would be no a significant improvement in metacognitive text structure awareness of the experimental group students due to metacognitive text structure awareness instruction.

Under this subsection of the study, the analysis of the responses of the experimental group from the metacognitive strategy questionnaire that was administered after the intervention was carried out. To understand how significantly the training of metacognitive text structure awareness strategy contributed to the level of participants' awareness of the strategy, a paired test was used as a statistical tool. As with the pretest questionnaire data, this data also violates assumptions of normality and homogeneity of variance. In such a circumstance, appropriate test for non-parametric paired samples test is recommended. In effect, Wilcoxon Rank Sign test was used a statistical tool to treat the data at hand.

The data collected on the three components of metacognitive text structure awareness reading strategies, namely, planning, monitoring, and evaluation is summarized in tables 12, 13 and 14 below. The median, Z score, two-tailed significance test and effect size were consecutively presented in each table.

Table 12 Planning Strategies

N=30 Df =29

Panning Strategies	Paired Tests	Median	Z	Sig. 1-tailed)	Effect Size /r/
1. Using Advance Organizers	Pretest Posttest	3.00 3.00	-4.506[b]	.000	.82
2. Previewing Reading Text	Pretest Posttest	4.00 3.00	-4.335[b]	.000	.79
3. Planning Reading Strategy	Pretest Posttest	3.50 3.00	-3.448[b]	.000	.63
4. Predicting Reading Content	Pretest Posttest	4.00 4.00	-3.957[b]	.000	.72
5. Setting Reading Purpose	Pretest Posttest	4.00 4.00	-4.245[b]	.000	.77
6. Relating to Experience	Pretest Posttest	4.00 4.00	-4.119[b]	.000	.75
7. Anticipating Task Requirement	Pretest Posttest	4.00 4.00	-3.557[b]	.000	.65
8. Viewing Tasks before Reading	Pretest Posttest	4.00 4.00	-3.945[b]	.000	.72

Based on negative ranks Planning Component Strategies, $p<0.05$

The above table reports Wilcoxon rank test data on planning strategies for pretest and posttest participant responses to metacognitive text structure awareness reading strategies. As the two-tailed p-value shows, substantial significance is displayed for all 8 planning category strategies, $p < 0.05$ for each Z score with the indicated effect size quotient.

The effect size of .82, which indicates the significance of using advance organizers such as italics, topics and sub-topics, highlighted or underlined information, bold written words seem to be the most used by the students in the experimental group due to the experimental intervention. This least used variable is planning reading strategies. Students do not seem to have as high understanding as the other variables in the category. They may lack a better understanding on how to plan appropriate reading strategies after the experimental intervention.

Table 13 Monitoring Strategies

N=30 Df =29

Monitoring Strategies	Paired Tests	Median	Z	Sig. (1-tailed)	Effect Size/r/
9. Checking online Comprehension	Pretest Posttest	4.00 3.00	2.271[b]	.031*	.42**
10. Identifying Text Structure	Pretest Posttest	3.00 4.00	3.987[b]	.000	.73
11. Testing Validity of Prediction	Pretest Posttest	3.00 3.50	4.345[b]	.000	.79
12. Checking Reading Goal	Pretest Posttest	3.00 3.00	3.900[b]	.000	.71
13. Evaluating Strategy Effectiveness	Pretest Posttest	3.00 3.00	3.127[b]	.001*	.57
14.Using Prior Knowledge and Experience	Pretest Posttest	4.00 4.00	3.819[b]	.000	.69
15. Fixing online Comprehension Problems	Pretest Posttest	4.00 4.00	4.179[b]	.000	.76
16. Guessing what Comes Next	Pretest Posttest	4.00 4.00	3.578[b]	.000	.65
17. Using Punctuation Marks	Pretest Posttest	3.00 4.00	3.947[b]	.000	.72
18. Using Grammatical Elements	Pretest Posttest	4.00 4.00	3.690[b]	.000	.67
19. Connecting Ideas in a Text	Pretest Posttest	3.00 3.00	2.333[b]	.031	.42**
20. Using Grammar and Punctuation to Identify Text Type	Pretest Posttest	4.00 4.00	2.714[b]	.008	.49**

Based on negative ranks, Planning category variables *p < 0.05 **Small effect size

Similar to the planning strategy components in Table 12 above, the metacognitive text structure awareness level of the students on monitoring component significantly improved as Wilcoxon Rank Sign test shows with the entire median and Z given, for which p< 0.05 for all variables in the category. However, the effect of the intervention on the variables numbered 9, 19, and 20 is smaller as the effect size quotient indicates.

The table below deals with the analysis of Paired Tests' metacognitive text structure awareness reading strategies of evaluation category (21-25). There are about five variables to be in treated in this category.

Table 14 Evaluation Strategies

N=30 df =29

Evaluation Strategies	Paired Tests	Median	Z	Sig. (1 tailed)	Effect Size /r/
21.Checking Strategy Effectiveness	Pretest Posttest	3 3	2.121[b]	.063	.40*
22.Completing Comprehension Tasks	Pretest Posttest	4 4	2.646[b]	.016*	.48
23. Self Questioning for Checking Understanding	Pretest Posttest	4 3	2.000[b]	.125	.36*
24. Making Inference from Reading	Pretest Posttest	3 4	2.236[b]	.031*	.41*
25.Using Graphic Organizers for Summary and Understanding	Pretest Posttest	4 4	3.162[b]	.001*	.57

Grouping Variable: Paired Tests * $p < 0.05$

Unlike the above two cases of planning and monitoring strategy components, the evaluation component of metacognitive strategy data analysis showed that there was no significant difference between the before and after intervention metacognitive text structure awareness of the students in the experimental group on the variables numbered 22, 24 and 25. The null hypothesis fails to be rejected concerning the assumed improvement of experimental group students' metacognitive text structure awareness on these variables. However, comparing these least improved variables the 22nd variables shows positive improvement as the given effect size indicates in Table 14 above.

There was a statistically significant improvement in metacognitive text structure awareness of the experimental group students due to metacognitive text structure awareness instruction.

4.4 Interview Analysis and Findings

In this section, I will deal with the analysis of students' interview responses. The fifth research question sought answers on what the relationship exists between metacognitive awareness of meta-discourse devices and identification of text structure types. In order to get in-depth understandings regarding the level of relationship between these variables, a 4 item semi-structured interview was designed. While the main purpose of the instrument is as stated here, it could also strengthen the findings by other instruments or show existing gaps

as it has the potential of collecting an in-depth data. The analysis of data gathered through interview has also shown consistent results with findings of questionnaire and tests (The interview transcript is found in Appendix F).

On the Effectiveness of the Training

The first question was aimed at eliciting responses that may indicate how effective the training given on metacognitive text structure awareness strategy was. All respondents reported that they were able to use the experience they got from the training to read and understand better. Besides, their responses imply that they faced difficulty while reading at different times. Student participant 6, for instance, said, “Passages are difficult for me to understand… I got small marks.” Reflecting on her post training experience she commented, “After I learned the training, I became better in reading because I started using the methods.”

Student participant 11 said that the passages became easy after he attended the training. The implication here is that the student might have had trouble as he read. Student participant 19 responded that he could then focus while reading and comprehends meaning after the training as opposed to his experience prior to the experimental intervention. Respondent 25 used the words ‘plan’ and ‘system’ in his response to refer to the metacognitive strategies he might have used in reading after the training. Student respondent 27 said that he has been able to improve his reading strategy use while reading difficult texts. Commenting on the degree of the importance of the training, the respondents respectively valued as greatly, very much, very much, very good and a lot.

On the Identification of Text Structure Using Meta-discourse Devices

The second question was the main question to which the other two add information that may adequately answer the research question. The main intention was to examine the relationship between metacognitive meta-discourse devices (transition or connective conjunctions, code glosses, frame markers and punctuation marks) awareness and text type identification in depth. This is because as discussed in the review of literature understanding text structure type is partly understanding what the writer intends to convey.

Accordingly, the students responded that they were able to identify most of the texts’ dominant structure types even though some of them simultaneously indicated that they found some reading texts in the pretest and reading comprehension were difficult to do so. The following are the list of metacognitive cues and strategies the respondents in table 15 claimed to use in the identification of dominant text structure types.

Table 15 Metacognitive Cues/Strategies Used by Respondents

Respondent	Cues/Metacognitive Strategies Used
6	Comma, questions, grammar, connective words, writers' purpose and objective, connecting ideas
11	Grammatical words, reference, thinking of plan and objective, connecting ideas, highlighting important points, punctuations marks
19	Central ideas highlight, connecting ideas, punctuations marks, and conjunctions
25	Thinking as I read, use punctuation, look at comprehension question first, plan well, use connective words
27	Conjunction, grammar, relation between sentences, what the writer wanted

As the information provided in the table indicates, even though the students reported fewer metacognitive strategies, they all seem to have metacognitive awareness of connective devices (transitional adverbial conjunctions, frame markers, code glosses) and punctuation marks.

On the Correlation of Meta-discourse Devices Use and Text Type Identification

After the analysis of all the questions of the interview, the answer of the respondents to the tenth item of the reading comprehension was checked against the claim of the respondents that they were able to identify text structure type using the clues given in table 15 above. Students 11, 25 and 27, provided correct responses to the question. As with these students, it seems logical that they were able to use different metacognitive clues consciously to identify the type of structure they read. The other two missed the 10 question of descriptive and causative texts. This may be because descriptive and causative texts are not as direct as the other three text types to decipher easily.

On Metacognitive Text Structure Awareness and Memory Enhancement

The third item was intended to see whether the respondents were able to visualize the main points in a reading text using advance and graphic organizers and in turn developed better retention and recall of information from the read texts. All respondents reported to have

improved their ability to remember important points from the reading passages with different degrees.

On the Effect of the Training on Participants' Strategy Awareness Level

The purpose of including the final interview question was to investigate the effect of the training on student's strategy awareness as they read. All the respondents responded that their awareness of metacognitive text structure reading strategy improved after they received the training.

4.5 Result Discussion

In this part of the paper, an attempt is made to explain the results of the study with reference to the hypotheses and the research question formulated at the beginning of the study. In doing so, the findings of the study were compared to the theory metacognitive text structure awareness reading strategy. The major ideas or themes of the study are followed by discussion in the subsequent sections below.

4.5.1 Metacognitive Text Structure Awareness Reading Strategy of the Study Groups before the Experimental Intervention

To answer the first question, the data collected using the metacognitive text structure questionnaire was analyzed quantitatively. Mann Whitney test was employed to analyze the questionnaire data. The result of the study showed that there was no statistically significant difference between and among the participants of the study who were randomly assigned into experimental and control groups ($p > 0.05$). Thus, it could be reasonably argued that the students' level of awareness of text structure as a metacognitive reading strategy in the comprehension of scientific text before the experimental intervention was not substantially different. The null hypothesis that stated that there would be no significant difference between the experimental and control groups on metacognitive text structure awareness was retained in effect.

4.5.2 Pretest Reading Comprehension Achievement of the Study Groups

Pretest reading comprehension test were used as instruments of data collection. The data obtained using the test was analyzed by running independent samples test. The result of the study showed that there was no statistically significant difference between and among the participants of the study who were randomly assigned into experimental and control groups

($p > 0.05$). They groups were homogeneous and were closely related on their reading comprehension performance.

The analysis of the data further revealed that EFL/ESL reading, more particularly science texts are demanding to comprehend. This was evident from the study groups' metacognitive text structure awareness level and their reading comprehension performance on the pretest mean scores. This finding is consistent with that of (Dymock, 2005; Farris et al, 1988; Ray, 2011). The 2010 Report by the National Assessment on grade 10 and 12 students on reading performance clearly pinpointed this discrepancy (National Assessment Report (NAR), 2010).

4.5.3 Posttest Reading Comprehension Test Achievement of the Study Groups

Did the students in the experimental group achieve significantly higher posttest mean scores than those in the control group?

The posttest reading comprehension tests were given to examine whether the applied strategy training could significantly contribute to higher scores by the participants in the experimental group. The result of the data analysis indicated that the null hypothesis that stated there would be no difference between the mean scores of the experimental and control groups due to metacognitive text structure awareness reading strategy training was thus rejected in favor of the alternative hypothesis.

A study by Phakiti (2006) demonstrated that there is strong link between metacognition and text structure awareness and use as well as enhanced memory. The finding of the current study conforms to this finding since the posttest reading comprehension of the experimental group substantially improved. This implies the experimental intervention had significantly contributed to the participants' self-regulatory awareness of the strategies employed in the comprehension of science texts. A host of EFL/ESL researchers indicated that metacogntion instruction could help students to better comprehend content area reading (Dymock, 2005; Meyer and Ray, 2011; Zarrati et al, 2014). What we can be understood from the analysis of the posttest reading comprehension can be viewed from this perspective. Without the intervention, the experimental group students would not have significantly gained strategy awareness, use and consequently scored higher mean scores than the control group comprehension performance of science texts.

4.5.4 Pre-Post Reading Comprehension Achievement of the Experimental Group Students

The paired tests was intended to test the null hypothesis, which stated that there would be no a statistically significant difference between the pretest and posttest mean scores of the experimental group on reading comprehension test due to metacognitive text structure awareness reading strategy instruction. The result of analyzed data showed a statistically significant difference at two tailed test ($p < 0.01$). The null hypothesis was consequently rejected and an alternative hypothesis that stated that there would be a statistically significant difference between the pretest and posttest mean scores of the experimental and control groups due to metacognitive text structure awareness reading strategy instruction was supported.

Alike on the posttest achievements, the students who received metacogntion instruction were found to have statistically improved test achievement when comparing the pre-post reading comprehension tests. This finding is in line with the assertion made by Carrel et al (1998); Gaddy et al (2008); Henter (2012); Phakiti (2005).

4.5.5 Knowledge Retention of the Study Group

t the beginning of the study, it was hypothesized that there would be no significant difference between mean scores of the experimental and control groups on knowledge retention test due to metacognitive text structure awareness reading strategy training. After validating the distribution of the data, independent sample test was run to examine whether there was a significant mean score difference between the experimental and the control groups on the second posttest. This was aimed at testing as to whether metacognitive text structure awareness reading strategy instruction could significantly contribute to the improvement of scores for the experimental group on the test.

The analysis of the knowledge retention test showed that there was significant mean difference between the study groups. The null hypothesis which stated that there would be no significant difference mean scores difference between the experimental and control groups on knowledge retention test was rejected in favor of the alternative hypothesis which stated that there would be a statistically significant mean score difference between the groups. Thus, it could be argued that instruction of metacognitive text structure awareness reading strategy instruction had impact on students' knowledge retention and recall. This is in accord

with the hypothesis of such authors as Grabe (2009); Livingstone, 1997; O' Malley and Chamot, 1986).

4.5.6 Metacognitive Text Structure Awareness Reading Strategy of the Study Groups after the Experimental Intervention

Wilcoxon Sign rank test was run and the result of the analysis as shown in tables 12-14, indicated a significant difference between the pretest and posttest text structure awareness levels of the experimental group. In effect, the null hypothesis that stated that there would be no statistically significant difference between the experimental group participants' pretest and posttest metacognitive text structure awareness reading strategy was rejected at the set alpha level of 0.05. The alternative hypothesis that stated there would be statistically significant metacognitive text structure awareness level between pretest and posttest was supported.

The pretest result of the study showed that the students in both groups had no significant difference on both instruments. The students' response on their level of metacognitive text structure awareness is closely correlated. Furthermore, the students scored nearly the same points on the pretest reading comprehension test. Students' awareness of the strategies under scrutiny was also found to be strongly correlated to the scores achieved by the students except for a few students who for unknown reason reported to have higher-level metacognitive text structure awareness. From this, it seems possible to deduce that the metacognitive awareness of text structure improved because of the intervention.

Independent samples test showed that the students in the experimental group scored significantly higher scores than those in the control group in both reading comprehension and knowledge retention tests. Two paired tests that were executed to examine the pretest and posttest differences of the experimental group on metacognitive text structure awareness and reading comprehension performance indicated that there was a substantial improvement on both variables among the participants in the group. The after-intervention reading scores and level of metacognitive text structure awareness level were found to be significantly higher when compared to that of the before-intervention scores of the same group.

Contrary to the above studies that reported the positive effect of metacogntive strategy instruction, a local research finding by Abiy and Adellahu (2013) reported that metacognitive strategy variables had no significant effect on students reading comprehension in their experiments. Besides this, Zhang (2007) and Yohannis (2013) respectively concluded their

finding on the effect of metacognitve instruction as ‘insignificant’ and ‘moderately correlated’. The finding of the current research, however, showed that contrary to this, the instruction played a pivotal role in developing students’ awareness of strategies used in the identification of science text structure. Thus, the higher and improved reading comprehension and knowledge retention tests scores were the effect of the instruction.

4.5.7 Experimental Group Respondents’ Awareness of *Meta-Discourse Devices*

By combining the result of the quantitative data that was aimed at testing the formulated hypotheses and answering research question, the current study has found out that the students in the experimental group did well on the reading comprehension test and knowledge retention test due to metacognitive text structure awareness reading strategy instruction. This implies that the students who took the training were able to plan, monitor and evaluate their strategy use while using meta-discourse devices and other cues in the identification of text structure types and hence achieve higher mean scores than those control group students in the comprehension of science texts and knowledge retention. This finding supports the finding by (Hynes, 2005; Zarrati et al, 2014; Hutchins, 1977; Monteanu et al, 2001; Yohanes (2013).

UNIT FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

This unit deals with summary, conclusion, and recommendations. In this section, first, a summary of the study and the major findings are made. Second, conclusions of the fundamental findings are drawn. Lastly, some possible recommendations are forwarded based on the findings of the study.

5.1 Summary

The purpose of this experimental study was to investigate the effect of text structure as a metacognitive strategy in the comprehension of science texts in the case of Bokoji Preparatory School natural science stream students. To this end, a sample of 62 students was randomly screened using SPSS random number generator. These participants were then assigned equally into the experimental and the control groups. In order to achieve this purpose of the study, the following specific questions were raised in the study.

The data were gathered mainly through questionnaire, tests, and a semi-structured interview.

After assigning the students into experimental and control groups, the students filled in metacognitive text structure awareness reading strategy questionnaire that was intended for the purpose investigating the level of students awareness on the strategies and comparing whether the groups had equal or closely correlated level of awareness. Additionally, the participants took a pretest reading comprehension test in order to see the equality and homogeneity of these formed groups.

The students in both groups received lessons by the student researcher for two 2 hours per session for six weeks. The students in the experimental group received instruction through metacognitive text structure awareness reading strategy whereas the others received in the traditional usual way for the same period of time on the same instructional materials. After the completion of the experimental intervention, both groups took two tests: posttest reading comprehension and a knowledge retention test. The first test was given to test whether there was a statistically significant mean difference between the experimental and control group students' reading achievement because of the text structure awareness as metacognitive reading strategy instruction. The second test was given to test the null hypothesis stating that there would be no difference between the experimental and control group students' on knowledge retention and information recall due to metacognitive text awareness strategy in the comprehension of science texts. Additionally, metacognitive text structure questionnaire was administered to the experimental group students in order to test whether their

metacognitive text structure awareness level significantly improved after the experimental intervention. Finally, five participants were randomly selected from the experimental group students for interview that was aimed to obtain an in depth data mainly on the fifth research question and to substantiate the findings from the analysis of the quantitative data.

Based on these procedures, the data collected was analyzed using different statistical tools and some findings were arrived at. Some of these findings were:

- The experimental and control group students were almost the same in their level of metacognitive text structure awareness and reading comprehension performance of science texts before the experimental intervention.
- .The students in the experimental group scored higher mean scores in the reading comprehension test and knowledge retention test than those in the control group after the experimental intervention.
- The experimental intervention (metacognitive text structure awareness strategy instruction) enabled the experimental group students to improve their posttest reading comprehension test scores and metacognitive text structure awareness level. These findings are presented under the next section in detail.

5.2 Conclusion

The pretest result of the study showed that the students in both groups had no significant difference on both instruments. The students' response on their level of metacognitive text structure awareness is closely correlated. Furthermore, the students scored nearly the same points on the pretest reading comprehension test. Students' awareness of the strategies under scrutiny was also found to be strongly correlated to the scores achieved by the students except for a few students.

Based on the analysis of the data, the following findings were obtained from the study:

Metacognitive Text Structure Awareness

Wilcoxon Sign rank test was run and the result of the analysis as shown in tables 12-14, indicated a significant difference between the pretest and posttest text structure awareness levels of the students in the experimental group. In effect, the null hypothesis that stated metacognitive text structure awareness strategy level experimental group participants' would not significantly improve due the intervention was rejected at the set alpha level of 0.05. Consequently, the alternative hypothesis was supported.

Reading Comprehension Performance

The posttest reading comprehension test was given to examine whether the applied strategy training could significantly contribute to higher scores by the participants in the experimental group because of the intervention. The result of the data analysis indicated there was clear difference between the groups on reading comprehension test. Therefore, the null hypothesis that stated there would be no difference between the mean scores of the experimental and control groups due to metacognitive text structure awareness strategy instruction was rejected in favor of the alternative hypothesis.

A paired test was also computed for the experimental group with the intention of testing the null hypothesis, which stated that there would be no a statistically significant difference between the pretest and posttest mean scores of the experimental group on reading comprehension test due to metacognitive text structure awareness reading strategy instruction. The result of analyzed data showed a statistically significant difference at two tailed test ($p < 0.01$). The null hypothesis was consequently rejected and an alternative hypothesis that stated that there would be a statistically significant difference between the pretest and posttest mean scores of the experimental and control groups due to metacognitive text structure awareness reading strategy instruction was supported.

The after-intervention reading scores and level of metacognitive text structure awareness level were found to be significantly higher when compared to that of the before-intervention scores of the same group. This demonstrated the effect of text structure as a metacognitive strategy in the comprehension of science texts.

Enhanced Knowledge Retention

The analysis of the knowledge retention test showed that there was significant mean difference between the study groups. The null hypothesis which stated that there would be no significant difference mean scores difference between the experimental and control groups on knowledge retention test was rejected in favor of the alternative hypothesis which stated that there would be a statistically significant mean score difference between the groups. Thus, it could be argued that instruction of metacognitive text structure awareness reading strategy instruction had impact on students' knowledge retention and recall. Independent samples test showed that the students in the experimental group scored significantly higher scores than those in the control group in both reading comprehension and knowledge retention tests.

By combining the result of the quantitative data that was aimed at answering the research question the current study concludes that the students in the experimental group did well on the reading comprehension test and knowledge retention test due to metacognitive text structure awareness reading strategy instruction. This implies that the students who took the training were able to plan, monitor, and evaluate their strategies while using meta-discourse devices to identify text structure types. Consequently, they were able to achieve higher mean scores than those control group students who received instruction through a traditional approach.

5.3 Research Implication and Recommendation

The analyzed data of this study shows that the participants in the experimental group gained a substantial awareness and control of their cognitive activities while reading after experimental intervention. The information provided by the participants in the experimental group demonstrated that L2 academic reading at the preparatory level is a complex process in which the students need to invoke a repertoire of metacognitive strategies consciously and actively. The students used these strategies to plan, monitor or control, evaluate, and remediate their comprehension while reading. Hence, the study clearly pin pointed that there is a direct relationship between metaciognitive text structure awareness and reading comprehension test scores. The current research confirmed the following claims made by scholars in the area of cognitive science and EFL/ESL teaching:

- Metacognitive text structure awareness reading strategy training can help learners improve their level of the strategy itself.
- Due to the enhancement of the level of metacognitive text structure awareness, students' posttest reading test scores increase.
- Students who are better aware of text structure as a metacognitive reading strategy have better retention and recall of information from a learnt material

Depending on the result of the study, it is possible to pinpoint some important points where other researchers who are interested to explore further on the area of the study or users of this research result may find worth emphasizing. Even though some students reported to have better metacognitive text structure awareness in the pretest and posttest administered questionnaires, there reading comprehension test result achieved seem to contradict this claim. The source of this discrepancy needs to be investigated using well-designed and controlled experimental studies.

This study provides empirical support for other research findings that cognitive and metacognitive strategies are crucial for L2 academic reading. Although some of strategies may emerge in the classroom naturally, most need to be developed through conscious tasks and activities. The findings offer implications for the classroom strategic reading instruction

The following recommendations can be forwarded based on the finding of this study:

First, there should be highly systematic and tightly controlled experimental designs by which students' real online use of these strategies can be investigated while they deal with reading comprehension tests. In the case of the current research, there was no a means to assess the real use of text structure awareness among the participants of the study due to constraint of the required devices such as video recorder. The study chiefly based on survey of students' response to metacognitive text structure awareness reading strategy questionnaire. Participants' strategy use investigation was mainly carried out indirectly by looking at the relationship between the responses given to the questionnaire and reading comprehension test achievements. Therefore, other interested researchers are expected to carry out research of their own to investigate the issue in depth.

Second, in order that the students may benefit from metacognitive text structure strategy instruction, there should be great effort by EFL teachers. Thus, text structure based lessons should be readily available especially where academic reading can pose great difficulty to students who struggle to comprehend science texts. Teachers are required to select texts from variety authentic sources to guide students on the use of metacognitive text structure awareness reading strategy.

Third, science teachers and language teachers can prepare materials on these lessons independently and/or by cooperation. Science teachers or other language teachers who may not be well acquainted with the knowledge of text structure as a metacognitive strategy may need to be given short-term training on the topic.

Fourth, as teachers have an indispensable role in the teaching/learning process, they need to be equipped with pertinent instructional strategies to build their capacity on solid foundations regarding the use and instruction of metacognitive strategies. Thus, short and long-term training programs need to be organized by government and NGO's for English language and science teachers to update their practice of method of such strategic reading instruction. Different stakeholders in the sector of education, such as supervisors, ministry of science and technology, curriculum planners, syllabus designers, and NGO's working for the

empowerment of the young in quality of education should play their part for the realization of this objective.

Finally, the current study was confined to a school case. Other researchers with better accessibility to more samples from different schools and who can easily overcome financial constraints may expand the scope of the study.

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APPENDICES

Appendix A: Metacognitive Text Structure Strategy Questionnaire and Students' Responses of Experimental and Control Groups before Intervention

This questionnaire is designed to gather information for educational research in a foreign/second English language teaching. The research questions focus on the exploration of the level of students' use of text structure awareness as a metacognitive reading strategy in comprehension of science texts. Your genuine and honest response to the questionnaire is worthwhile. Thus, you are kindly requested to read the questions thoroughly and provide your responses to each question by ticking '√' in the column of your choice. The information will be kept strictly confidential, and will not be used to assess you in any way.

I am grateful for your cooperation.

Thank you in advance!

Experimental Group Metacognitive Strategy Questionnaire Response before Intervention

No	Strategy Type	Rating Scales				
		1	2	3	4	5
1. Planning Strategies						
1	How often do you use advance organizers such as topics and subtopics, italics and margin notes to visualize the structure type (comparison, causative, enumerating, etc) used in the reading text? (PLAO)	3	2	14	9	3
2	How often do you skim and scan/preview your text before actually reading it in detail? (PLTP)	3	8	13	4	3
3	How often do you plan & use appropriate reading strategy when you approach a reading text? (PL ST)	1	3	8	10	9
4	How often do you predict the possible content of a reading text before you read it just by looking at topic, table, figure, diagrams etc? (PLPR)	2	2	14	9	4
5	How often do you set reading goal/purpose before you read? (PLRP)	2	3	11	9	6
6	How often do you try to relate the topic of your current reading to your previous knowledge and personal experience?(PLRKE)	2	3	13	10	13
7	How often do you think about task expectation (what may be required to answer)? (PLTE)	2	2	11	12	4
8	How often do you view the tasks given before reading? (PLVT)	2	2	7	13	7

No	Strategy Type	Rating Scales				
		1	2	3	4	5
2. Monitoring Strategies						
9.	How often do you remind yourself when comprehension breakdown happens in the middle of reading? (MOCTC)	1	3	4	10	13
10.	How often do you understand whether a given text is about cause-effect relationships, comparison, enumeration, description, sequencing/instruction and classification or problem-solution presentation? (MOUTS)	1	3	18	7	2
11.	How often do you try to test the validity of your prediction as you read? (MOTPV)	3	3	12	10	3
12.	How often do you check the reading goal you set before beginning reading? (MOCRG)		1	14	9	7
13.	How often do you evaluate whether your reading strategy chosen is being effective or not? (MOSTE)	1	5	17	4	4
14	How often do you test whether your previous knowledge of the topic and personal experience is concomitant with your current reading? (MOPKE)	1	3	12	12	3
15	How often do you try to fix your comprehension problem whenever it happens (for example by rereading a line, or by stopping reading for a while and thinking about it, or reading aloud etc? (MOFCP)	2	4	11	8	6
16	How often do you guess what comes next as you read in a reading text and think about its validity? (MOGCN)	2	7	12	5	5
17	How often do you use punctuation marks such as the question mark, hyphen, colon semi-colon, and comma to support your comprehension? (MOPMC)	2	10	12	5	2
18	How often do you use grammatical elements such as adverbs, conjunctions, or other cues to comprehend a reading text? (MOGEC)	1	7	16	6	1
19	How often do you try to figure out the connection between sentences and ideas expressed there in (for example by encircling, highlighting etc)? (MOCIS)	1	4	5	11	10
20	How often do you use different grammatical elements (adverbials, conjunctions & other textual features) and punctuation marks to identify the structure of a reading text (whether it is comparison, causative, listing, sequencing, classification, or problem-solution)? (MOPGTS)	1	2	7	11	10

Appendix B: Experimental Group Metacognitive Strategy Response after the Experimental Intervention

No	**Strategy Type**	Rating Scales				
		1	2	3	4	5
Planning Strategies						
1	How often do you use advance organizers such as topics and subtopics, italics and margin notes to visualize the structure type (comparison, causative, enumerating, etc) used in the reading text? (PLAO)			4	13	13
2	How often do you skim and scan/preview your text before actually reading it in detail? (PLTP)			5	11	14
3	How often do you plan & use appropriate reading strategy when you approach a reading text? (PL ST)			3	14	13
4	How often do you predict the possible content of a reading text before you read it just by looking at topic, table, figure, diagrams etc? (PLPR)			5	9	16
5	How often do you set reading goal/purpose before you read? (PLRP)			4	14	12
6	How often do you try to relate the topic of your current reading to your previous knowledge and personal experience?(PLRKE)			5	8	17
7	How often do you think about task expectation (what may be required to answer)? (PLTE)			7	7	16
8	How often do you view the tasks given before reading? (PLVT)			4	14	12

No	**Strategy Type**	Rating Scales				
		1	2	3	4	5
Monitoring Strategies						
9.	How often do you remind yourself when comprehension breakdown happens in the middle of reading? (MOCTC)			5	14	11
10.	How often do you understand whether a given text is about cause-effect relationships, comparison, enumeration, description, sequencing/instruction and classification or problem-solution presentation? (MOUTS)			7	10	13
11.	How often do you try to test the validity of your prediction as you read? (MOTPV)			6	8	15
12.	How often do you check the reading goal you set before beginning reading? (MOCRG)			4	13	13
13.	How often do you evaluate whether your reading strategy chosen is being effective or not? (MOSTE)			16	6	8
14	How often do you test whether your previous knowledge of the topic and personal experience is concomitant with your current reading? (MOPKE)			8	9	13
15	How often do you try to fix your comprehension problem whenever it happens (for example by rereading a line, or by stopping reading for a while and thinking about it, or reading aloud etc? (MOFCP)			5	11	14
16	How often do you guess what comes next as you read in a reading text and think about its validity? (MOGCN)			14	7	8
17	How often do you use punctuation marks such as the question mark, hyphen, colon semi-colon and comma to support your comprehension? (MOPMC)			18	5	6
18	How often do you use grammatical elements such as adverbs, conjunctions, or other cues to comprehend a reading text? (MOGEC)			18	4	8

19	How often do you try to figure out the connection between sentences and ideas expressed there in (for example by encircling, highlighting etc)? (MOCIS)			9	10	11
20	How often do you use different grammatical elements (adverbials, conjunctions & other textual features) and punctuation marks to identify the structure of a reading text (whether it is comparison, causative, listing, sequencing, classification, or problem-solution)? (MOPGTS)			6	11	13

No	**Strategy Type**	Rating Scales				
		1	2	3	4	5
Evaluation Strategies						
21	How often do you evaluate the effectiveness of the reading strategy you implemented in achieving your reading goal? (EVSTU)	1	4	14	10	2
22	How often do you complete comprehension questions/tasks after reading to evaluate your overall reading comprehension? (EVCRC)		3	19	7	2
23	How often do you self-question after reading to test your overall text understanding? (EVSQU)			10	9	12
24	How often do you try to relate your understanding of a text to prior knowledge and real life experience? (EVRKL)		4	5	10	12
25	How often do you use graphic organizers (such as tables, arrows, mind maps etc) to summarize what you have read? (EVSGO)			14	4	13

Appendix B: Control Group Metacognitive Text Structure Awareness Strategy Questionnaire and Responses

No	Strategy Type	Rating Scales				
		1	2	3	4	5
1. Planning Strategies						
1	How often do you use advance organizers such as topics and subtopics, italics and margin notes to visualize the structure type (comparison, causative, enumerating, etc) used in the reading text? (PLAO)	2	4	13	8	4
2	How often do you skim and scan/preview your text before actually reading it in detail? (PLTP)	0	10	14	7	0
3	How often do you plan & use appropriate reading strategy when you approach a reading text? (PL ST)	1	2	9	10	9
4	How often do you predict the possible content of a reading text before you read it just by looking at topic, table, figure, diagrams etc? (PLPR)	0	4	14	9	4
5	How often do you set reading goal/purpose before you read? (PLRP)	1	3	12	10	5
6	How often do you try to relate the topic of your current reading to your previous knowledge and personal experience?(PLRKE)	2	3	14	8	4
7	How often do you think about task expectation (what may be required to answer)? (PLTE)	2	3	10	13	3
8	How often do you view the tasks given before reading? (PLVT)	0	3	8	14	6

No	Strategy Type	Rating Scales				
		1	2	3	4	5
2. Monitoring Strategies						
9.	How often do you remind yourself when comprehension breakdown happens in the middle of reading? (MOCTC)			5	14	11
10.	How often do you understand whether a given text is about cause-effect relationships, comparison, enumeration, description, sequencing/instruction and classification or problem-solution presentation? (MOUTS)			7	10	13
11.	How often do you try to test the validity of your prediction as you read? (MOTPV)			6	8	15
12.	How often do you check the reading goal you set before beginning reading? (MOCRG)			4	13	13
13.	How often do you evaluate whether your reading strategy chosen is being effective or not? (MOSTE)			16	6	8
14	How often do you test whether your previous knowledge of the topic and personal experience is concomitant with your current reading? (MOPKE)			8	9	13
15	How often do you try to fix your comprehension problem whenever it happens (for example by rereading a line, or by stopping reading for a while and thinking about it, or reading aloud etc? (MOFCP)			5	11	14
16	How often do you guess what comes next as you read in a reading text and think about its validity? (MOGCN)			14	7	8
17	How often do you use punctuation marks such as the question mark, hyphen, colon semi-colon and comma to support your comprehension? (MOPMC)			18	5	6
18	How often do you use grammatical elements such as adverbs, conjunctions, or other cues to comprehend a reading text? (MOGEC)			18	4	8
19	How often do you try to figure out the connection between sentences and ideas expressed there in (for example by encircling, highlighting etc)? (MOCIS)			9	10	11
20	How often do you use different grammatical elements (adverbials, conjunctions & other textual features) and punctuation marks to identify the structure of a reading text (whether it is comparison, causative, listing, sequencing, classification, or problem-solution)? (MOPGTS)			6	11	13

No	Strategy Type	Rating Scales				
		1	2	3	4	5
3. Evaluation Strategies						
21	How often do you evaluate the effectiveness of the reading strategy you implemented in achieving your reading goal? (EVSTU)			20	2	8
22	How often do you complete comprehension questions/tasks after reading to evaluate your overall reading comprehension? (EVCRC)			19	5	6
23	How often do you self-question after reading to test your overall text understanding? (EVSQU)			6	12	12
24	How often do you try to relate your understanding of a text to prior knowledge and real life experience? (EVRKL)			9	13	8
25	How often do you use graphic organizers (such as tables, arrows, mind maps etc) to summarize what you have read? (EVSGO)			3	15	12

Appendix C: Questions for Experimental Intervention

Text one –Topical Description/main idea Time allowed: 30 minutes

Direction: Read the following text thoroughly and the questions that follow.

The particle model of matter is a way of visualizing what individual particles are doing inside a substance. In solids, particles are vibrating. In liquids and gases, particles are moving more freely. In all cases, the particles have kinetic energy; this causes them to collide with their neighbors. As a result, energy is distributed throughout the substance. There is a range of different particle speeds and directions within the substance: so many, in fact, that we say the motion is random. However, on average if the particles in the substance are vibrating faster we would say that the substance is hotter-the temperature is higher. Temperature is something that we all have experience of. If we place two bodies of different temperature in contact, then the particles at the boundary will collide and the kinetic energy of particles is transferred backwards and forwards between the objects.

A 'body' is another word for an object. On average, the particles in the hotter body have more kinetic energy than those in the colder body, so there is a net transfer of thermal energy from the hotter body to the colder body. The process is referred to as heating. This is the only way that the word heat can be used. A body does not contain or posses heat. This is just the same as an electrical component, which does not contain or posse's electrical current. Instead we will use the term internal energy to describe the total energy that is internal to bodies.

1. According to the text, which of the following is true about particle model of matter?

A) Particles in all state of matter move freely

B) It is only in the case of gases and liquids that particles collide with each other.

C) It is possible to deduce that particles in gases and liquids move with the same speed.

D) Distribution of energy in a substance is due to collision of particles therein.

2. What make(s) particles motion random?

A) The direction in which the particles move.

B) The speed at which the particles move

B) The supply of energy to move the particles

D) A and B are answers.

3. One of the following statements cannot be inferred from the idea discussed in the second paragraph. Which one is it?

A) Particles in substances with temperature difference move in one direction.

B) Kinetic energy of particles in substances with difference in temperature move in opposite direction

C) Kinetic energy of particles is transferred forward and backwards between substances with temperature difference

D) A body is one thing and an object another.

4. Which of the following options best express the characteristics of the particles in colder objects? These particles:

A) have less energy than the hotter one

B) have more energy than the hotter one

C) move slowly than those in hotter one

D) have similar internal energy with those in hotter one

5. It is implied in the text that:

A) as kinetic energy is to particle movement so is thermal energy to net heat transfer

B) heating is different from net heat transfer between two objects

C) a body is analogous to an electrical equipment as the former does not contain heat and the later contains electrical current

D) heat is synonymous to temperature

6. As discussed in the text what directly causes thermal energy transfer?

A) Internal energy B) temperature C) kinetic energy D) electrical energy

7. The correct order of actions/processes in a substance as discussed in the paragraph is:

A) heat→ particle collision → random movement of particles→ kinetic energy of particles

B) kinetic energy of particles→ random movement of particles→ heat→ particle collision

C) heat→ kinetic energy of particles→ particle collision→ random movement of particle

D) particle collision→ kinetic energy of particles→ heat→ random movement of particles

8. The transfer of kinetic energy of particles between two objects in contact is:

A) Bidirectional B) unidirectional C) forward D) backward

9. The main purpose of this text writer is to:

A) Enumerate the processes involved in the particle model of matter

B) Describe the concept of particle model of matter

C) Express cause-effect relation between heat and particle movement

D) Compare and contrast particles in matter in all the phase

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Text Two- Problem-Solution

Theoretical Efficiency of Heat Engines Time allowed 30 minutes

Direction: Read the following short text thoroughly and the questions that follow.

Complete conversion of energy from a hot source into work is not possible. A common value for diesel engine efficiency is, for example, 30%. Petrol engines have even lower efficiency. This shortage is due to the design of the engines that result in several energy losses, mainly through friction. What complicates the problem further is the fact that it results in additional transfer of heat to the surrounding. So how this inefficiency of heat engines could be improved? Theoretically, the greater the absolute temperature difference between the hot source and cold sink, the greater the maximum efficiency will be. In practice, however, increasing the temperature of the hot source causes significant problems in terms of the material expansion of the components inside the engine. In order to increase the efficiency of future engine designs, many engine designers are now researching new materials that can withstand higher temperatures.

1. The problem with the heat engine is that

A. Their energy can be completely converted into work

B. Their theoretical maximum efficiency cannot be achieved.

C. They conserve a lot of heat energy.

D. They cannot be 100% efficient.

2. The main cause for the problem with heat engine is:

A. Heat loss (due to friction)

B. Absorption of heat

C. High temperature difference between the engine and its surrounding

D. Cold sink

3. Maximum theoretical efficiency of engines is impossible because:

A. Heat transfers to the surrounding

B. Temperature increases in the engines

C. The general principle dictates so

D. The cold sink is absolutely cold

4. What goes wrong if we were to increase the temperature of the hot source to increase engine efficiency?

A. The engines will grow noisy.

B. Expansion results in malfunctioning of internal components.

C. Nothing goes wrong at all.

D. None.

5. How do you think engine efficiency problem can be improved?

A. By improving the designs of current engines

B. By using materials with higher temperature resistance

C. By putting engines in extreme cold environment

D. A and B are correct answers.

6. According to the information in the text, as the absolute temperature difference between the hot source and the cold sink increases:

A. So does the maximum theoretical efficiency.

B. Engines' efficiency will decrease.

C. The internal components of the engine will expand.

D. Significant problem will be created.

7. As one can infer from the text:

A. Engines are remarkable human inventions.

B. Thermodynamic principles do not hold true for engine working.

C. Temperature is one barrier to maximum engine efficiency.

D. Design and material in engine do not affect their heat.

8. What do heat engines do during performance/operation? They:

A. Produce heat

B. Produce electricity

C. Absorb heat

D. None

9. The main purpose of the text writer is to

A. discuss engine problems and point out possible solutions

B. describe what heat engines are

C. compares and contrast different parts of engines

D. sequence procedures/processes involving how engine works

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Text Three-Causative

Cycle Pumping Time allowed 30 minutes

Direction: Read the following short text thoroughly and the questions that follow.

Heating of a system does not necessarily result in energy transfer into or out of it. If we push the plunger of a bicycle pump very rapidly whilst blocking the hole at the end of the pump with our finger, the air inside the pump is compressed. The mechanical work that is done on the air results in an increase in the internal energy of the air. As there is no phase change, the average potential energy of the molecules stays constant but the average random kinetic energy of the molecules increases; evidence of this is an increase in the temperature of the air. As the compression takes place rapidly, there is a negligible time in which energy transfer to the surrounding by heating can occur, and the process is nearly without energy transfer or adiabatic. Of course, after the compression is complete, the temperature gradient between the system and its surrounding will result in an energy transfer from the system, resulting in a decrease in the internal energy of the air (and warming of the pump, the surrounding air and your hand).

1. Which one of the following statements is different from the information touched upon in the text?

A) An adiabatic process happens because of heating.

B) Even though there may be heating process, there will be no energy transfer in adiabatic process.

C) The increase in the internal energy of the air in the bicycle pump is the cause for the mechanical work done.

D) The average potential energy of air molecules does not vary since there is no phase change.

2. Why do you think the time in which energy transfer can occur is negligible under the conditions discussed? It is because:

A) the process does not need heating

B) the compression of air takes place rapidly

C) the average random kinetic energy increases

D) the average potential energy decreases

3. What will happen as a result of pressing plunger of a bicycle pump rapidly by blocking the hole at its end?

A) The air inside the pump is compressed

B) The air outside the pump expands

C) Mechanical work is done on the air

D) A and C are correct answer.

4. One of the following given alternatives cannot occur as a result of the mechanical work mentioned in the text. Which one is it?

A) Compression of gas/air and increase in temperature

B) Increasing of thermal energy

C) Increasing of average kinetic energy of the air molecules

D) Increasing of average potential energy of the air molecules

5. Why is the process of pumping a bicycle is nearly adiabatic as mentioned in the text? It is because:

A) temperature of the air in the pump increases.

B) it does not involve heat and thus no energy transfer.

C) there is little time for energy to transfer to the surroundings by heating.

D) average kinetic energy increases to do the pumping.

6. Of the following options given which one shows the correct arrangement of relations of the topic discussed?

A) air compression → mechanical work→ internal energy→ average random kinetic energy

B) mechanical work→ air compression → internal energy→ average random kinetic energy

C) internal energy → average random kinetic energy → mechanical energy→ air compression

D) Average random kinetic energy→ internal energy→ mechanical energy→ air compressions

7. It is indicated that unlike the average potential energy of the air, average kinetic energy of the air molecule increases. How can this be known?

A) By inspecting the temperature of the air

B) By neglecting the time compression takes

C) By rapidly moving the plunger

D) By completing the compression required

8. What can be figured out from the text under the situation of pumping is:

A) Adiabatic process is totally impossible in the absence of heat.

B) Adiabatic process may cease to exist after a complete compression.

C) Transfer of energy from a system is totally possible.

D) The process discussed is not completely adiabatic.

9. The purpose of the writer of this text is mainly to:

A) compare and contrast adiabatic process with other processes

B) discuss the cause and effect relationship between mechanical work and a system response

C) describes what an adiabatic process is

D) classify and list steps in an adiabatic process

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Text Four- Comparison

Diesel and Petrol Engines Time allowed: 30 minutes

Direction: Read the following short text thoroughly and the questions that follow.

Just like a petrol engine fuel is burnt inside a piston in the case of diesel engine. This piston moves up and down and extracts some thermal energy as mechanical work. This is then usually used to turn a driveshaft and subsequently turn the wheels on a vehicle. In both cases

some thermal energy is transferred to the surrounding. Of course, many processes in these engines are similar. However, there are a few differences in the processes involved. A key difference is the processes of adding heat to the system. In diesel engine it is isobaric-pressure remains constant, whereas in petrol engine it is isochoric-combustion happens almost instantaneously. One of the other obvious differences is the fact that there is no spark plug in diesel engine as in petrol engine; the fuel-air mix is ignited in a different way. Secondly, pistons are usually longer in a diesel engine for some apparent reasons.

1. The main purpose of the writer is to:

A. Classify the types of engines

B. Compare petrol and diesel engines

C. Describe process of engine working

D. List steps on how engines are built

2. Petrol and diesel engines are alike in all of the following except:

A. Fuel is burnt inside the piston in both

B. Both involve mechanical work

C. Heat is produced in each

D. Both have the same piston size

3. Petrol engines are different from the diesel ones as:

A. The former involve no heat produce as the later do

B. The former involves isobaric heating process, while the later isochoric

C. There is no spark plug in petrol engines as in the diesel ones

D. Diesel engines have shorter pistons than the diesel engines

4. As squirting into the piston is to diesel engines, so is_____to petrol engines.

A) Sparking

B) Valve

C) Combustion

D) Ignition

5. The processes involved in petrol and diesel engine work are:

A) Largely similar B) largely different C) totally unrelated D) incomparable

6. What makes the wheels on cars move?

A) pistons B) thermal energy C) driveshaft D) fuel

7. As one can figure out from the text, diesel and petrol engines can be represented by:

A) different sketches B)similar sketches C) pistons D)undetermined

8. Which one of the following alternatives shows the common working elements for both engine types?

A)piston, driveshaft and pressure

B) piston, fuel mix, squirting and mechanical work

C)turning wheels, heat production, oil use and isochoric process

D) mechanical work, heat production, pressure and oil squirting

9. Which one of the following engine parts do you think gets hotter soon?

A) Driveshaft B) piston C) wheels D) axle

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series(vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Text Five -Sequencing/Process description

How do heat engines work? Time allowed 30 minutes

Direction: Read the following short text thoroughly and the questions that follow.

Most heat engines use thermodynamic processes and involve gases doing work. The volume of the gas in the engine is first reduced at a constant pressure (isobaric). This may be achieved through a slow compression, allowing heat to flow out of the system or more commonly by rapidly cooling the system. Heat is then allowed into the system (QH or Qin). This is often achieved by igniting a fuel air mix. This may cause a rapid increase in pressure, whilst the volume remains constant. No work is done on or by the gas and so all of the energy goes into increasing the internal energy of the gas. This gives rise to an increase in temperature and so an increase in pressure. The gas may then expand and it does so it does work on its surroundings. Heat energy is then extracted from the system at a constant volume. This leads to a drop in pressure and the system returns to its starting point. This process then repeats or cycles.

1. According to the information discussed in the text, which one of the following is true?

A) All heat engines use thermodynamic processes.

B) In all heat engines work is done by gases.

C) The process of engine work is circular.

D) Temperature and pressure are inversely proportional.

2. How can we achieve reduction of gas in heat engines?

A) By slow compression of gases

B) By allowing heat flow out of the system

C) By rapidly cooling the system

D) All are answers.

3. What happens due to slow gas compression as stated in the text?

A) Heat escapes the system.

B) Heat increases in the system.

C) Engines stop working.

D) Gas volume remains constant.

4. Allowing heat into a system becomes possible by:

A) Increasing temperature

B) Decreasing pressure

C) Igniting a fuel air mix

D) Increasing gas volume

5. Which one of the following alternatives can be inferred from the text?

A) As pressure increases so does gas volume

B) Gas volume will always remain constant

C) There is a time when the system stops working

D) The process repeats with reduction of gas volume

6. The extraction of heat energy from the system at constant volume results in:

A) increase in gas volume

B) restarting of the system process

C) expansion of gas

D) increase in gas volume

7. The correct order of the major processes involved in engine performance is:

A) Decreasing pressure→ decrease in gas volume→ allowing gas into the system→ Increase in temperature→ Increase in pressure→ work done→ extraction of heat from the system

B) Decrease in gas volume→ allowing gas into the system→ decreasing pressure→ increase in pressure→ increase in temperature→ work done→ extraction of heat from the system

C) Increase in temperature→ allowing gas into the system→ work done→ increase in pressure→ decrease in gas volume→ decreasing in pressure→ extraction of heat from the system

D) Allowing gas into the system→ extraction of heat from the system→ decreasing in pressure→ decrease in gas volume→ increase in temperature→ increase in pressure→ work done

8. When there is no work done, by the gas in the system, what follows is:

A) Increase in internal energy of the gas

B) Decrease in the pressure of the gas

C) Compression of the gas in the system

D) Decrease in the volume of the gas

9. The main purpose of this text writer is to:

A) express causative(cause-effect relationship) among/between different topics

B) compare and contrast issues raised

C) sequence different processes/procedures

D) describe what heat engines are and what they are like

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

Equal number of horizontal and connected boxes/table/graph/pie-chart/t-charts pictures of different sizes, colors and shapes

Time series(vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

Conceptual/mind maps/tree-diagrams/pie-charts/tables

Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'.

Appendix D: Answers to Reading Comprehension Tests

Q. No	Description	Problem/Solution	Causative	Comparison	Sequencing
1	D	B	D	B	C
2	D	A	B	D	D
3	C	A	D	B	A
4	C	B	D	D	C
5	A	D	C	A	D
6	C	A	B	C	B
7	C	C	D	A	A
8	A	A	B	A	A
9	B	A	D	B	C
10					

Total Number of Items=5x10=50

Appendix E: Knowledge Retention Test (posttest 2) and Answers

Instruction

The following fill in the gap questions were written based on the texts you read during the first and second tests of reading comprehension. Read each question carefully and fill in the blank spaces as quickly as possible. Do not bother about how well-written your responses are with respect to spelling and grammar as long as they can convey complete and an unambiguous message.

1. _____is an example of an adiabatic process, a condition where there may be no heat energy transfer due to action of heating a system.

2. _____is not the same as heat.

3. Before heat engines begin working, their volume of gas is first _____at a constant_____

4. Engine efficiency can be improved by:

_____

_____

5. _____and _____ are examples of heat engines which can be compared to each other on their overall working process.

6. _____and _____are examples of application of Doppler Effect.

7. A mechanical work on a system results in _____

8. Heat engines are generally classified into_____groups.

9. Mention three topics of the reading texts of your previous test.

A. _____

B. _____

C. _____

10. The _____in diesel engines are relatively longer than those in petrol ones.

Possible Answers

1. Bicycle pumping

2. Temperature

3. Reduced/ pressure

4. A. Modifying the design of current engines B. Using a heat resisting materials

5. Petrol and diesel

6. A. Medical imaging B. Radar technology

7. Transfer of heat (energy)

8. Two

9. Internal Energy, Adiabatic Process, Engine Cycles, Heat Engines Efficiency, Doppler Effect etc.,

10. Pistons

Appendix F: Students' Interview Guide and transcribed response note

Thank you in advance for you collaboration to respond to my interview questions. I greatly value your genuine response. Your privacy will never be exposed to anybody else in any way. I hope we will have good time while sharing some valuable information.

Name: _____

Sex: _____

Age: _____

Section: _____

Semi-structured interview questions

Do you think the training you received for the past six weeks helped you to understand better while reading when compared to the time before training? How much do you think it did help?

Were you able to identify the dominant type of text structure in the reading texts? If yes, what did exactly help you to do so? Can you state that with the texts you took tests on?

Do you think taking the training helped you to remember easily some points from the post reading comprehension test text? How do you evaluate it when compared to your pre training experience?

Do you think your awareness of metacognitive text structure increased after the training? How significant do you think it has become?

Student Participant Responses

Student Participant 6

TR: Do you think the training you received for the past six weeks helped you to better understand while reading when compared to the time before training?

SP: Yes, I think. The training was very good. The passages are always difficult for me to understand. So I got small marks in reading passages. Before learnt the training I didn't understand passage what they say. I also get small marks due to this. After I learnt the training I became better in reading because I began using different methods.

TR: How much do you think it did help?

SP: It helped me greatly.

TR: Were you able to identify the dominant type of text structure in the reading texts? If yes, what did exactly help you to do so?

SP: Yes I was able to identify all passage except one. I do not know it is but. The dominant types of structures are showing by different methods like comma, question marks, grammar and connecting words. I used these things and idea relation as well as what the writer objective is when writing to understand the passage and know text structure.

TR: Can you state with the texts you took tests on?

SP: I don't remember all. But I know if I see the passages.

TR: Do you think taking the training helped you to easily remember some points from the post reading comprehension test text?

SP: I am sure my ability to remember knowledge of is improved. I wasn't remember some points from passages before I received the training. It helped me to read and understand highly. Because of this I can also remember a lot of information.

TR: Do you think your awareness of metacognitive text structure awareness increased after the training?

SP: Yes. I think my awareness increased after the training more than before that training. Because I remember when I read. However, not before I learnt the training.

TR: How significant do you think it has become?

SP: Very significant.

TR: Thank you. Have nice time.

Student Participant 11

TR: Do you think the training you received for the past six weeks helped you to better understand while reading when compared to the time before training? How much do you think it did help?

SP: Yes, I think it helped me to understand easily the passage I read. The training greatly important to understand the passages, I improved my reading and to get better understanding of difficult passages.

TR: How much do you think it did help?

SP: It helped me very much.

TR: Were you able to identify the dominant type of text structure in the reading texts? If yes, what did exactly help you to do so? Can you state with the texts you took tests on?

SP: I think I was able to identify all the passages type structure descriptive, sequence, causative,, comparison and problem and solution. I used the strategies we learned by you. Such as connecting ideas, thinking of our plan, objective, if we are getting main ideas and answering comprehension questions. Additionally, using of connecting grammatical words and so on. Before training, I use only little strategies because I don't know them at that time. After I got training, I can read and try to understand any passages simply by understanding the strategies.

Before, I can't remember anything from passage exam even topic of the passage. I now focus when I read and use the strategies and because of this I also remember many concepts from passage.

I believe that I feel also confident when I study because of my awareness of the strategy I learned. I remember the strategies when I want to for reading. As a result my awareness of reading systems increased very well.

It was very much significant in helping to know the points that are main and come on examinations.

Student Participant 14

SP: Yes it helped me. More than before I can read with system and understand everything. I read with plan.

TR: How much do you think it did help?

SP: The training was very important and so it supported me very much. I know a little before I get the training. After that, I get the training and I am better understanding when I try to read and answer questions on passage.

Yes, I was able to identify structure of those passages. I did know only the first passage. But I think it was descriptive or causative. The others are simple when I used the strategies learned in class. I used different strategies such as central ideas, highlighting main ideas and connecting, punctuation marks, grammar, conjunction etc

Yes, I remember better because I read deeply by using different methods I said. And because of this I cant forget. If I didn't use the method when I trying to answer question in exam, I wasn't remember anything on that passage. But because of the strategies I learned there is change when I read and remember the passages idea easily. This indicate that I am understanding the passage to remember the main points.

Yes. After I got that training my degree of understanding developed highly. I will use the systems and strategies I if I want to read. My awareness is better now. It is not as early.

Student Participant 4

TR: Do you think the training you received for the past six weeks helped you to better understand while reading when compared to the time before training?

SP: The training helped me yes.

TR: How much do you think it did help?

SP: To understand better after reading. The training was very nice. The passages became easy after I know and used them. But before that I can't understand because difficult.

TR: Were you able to identify the dominant type of text structure in the reading texts?

SP: Yes I identified three passages exactly I know. Two are little difficult to know the structure.

TR: What did exactly help you to do so?

SP: I used many strategies like highlighting some points like punctuation marks, conjunctions, or grammar, association between sentences.

TR: Can you state with the texts you took tests on?

SP: I cannot remember all now. The first passage was difficult to tell the structure. The other is good and easy.

TR: Do you think taking the training helped you to easily remember some points from the post reading comprehension test text?

SP: Yes, the training helped me to remember important points in the reading content. Before that training, I did not remember main ideas. Now I remember much information from passages after I stay a long time.

TR: How do you evaluate it when compared to your pre training experience?

SP: Very good

TR: Do you think your awareness of metacognitive text structure increased after the training?

SP: Yes, awareness of text structure increased for me. It is very different for me before. I read with strategies. Due to this reason, I remember also the strategies when I read and study all subjects.

TR: How significant do you think it has become?

SP: *Very*

Student Participant 5

Yes it helped me a lot to read by focusing on important points only and by using different strategies that we learned.

I identify all the passage text type easily because I know the strategies to use in a short time. What helped me to identify is that grammar, conjunction, the relation between sentences and others.

Yes. After I gained the strategy knowledge I used them in reading. That made me to remember what I was reading in the past after I stopped reading. This I think because I read deeply and understand things.

Yes, I know the strategies and I can also use when I want reading. I simply read without understanding before. But now I use different strategies and read and understand clearly. I also like to use the strategies when I read all subjects. Because of this I understand the main ideas in the passage

Appendix G: Lesson Template for Experimental Intervention

Modeling→ Consolidation→ Practicing→ Production→ Scaffolding

Lesson one: General Introduction

Time allocated for the specific lesson: 2hrs

Model example on how students were taught. The following key points were included by the student researcher:

Structure Definition

Signal Words

Punctuation Marks-comma, colon, semi-colon, parenthesis, small hyphen, and question mark

Advance Organizers

Graphic Organizers

Summary Questions

Paragraph Frames

1. Description

-What does the writer wants to do? The author explains a topic, idea, person, place, or thing by listing characteristics, features, and examples.

-Focus is on one thing and its components.

For example, characteristics are such as, looks like, consists of, for instance, most important

We look for topic word (or synonym) to be repeated throughout the text.

What specific person, place, thing, event, or concept is being described? How is the topic described? How does it work? What does it do? What does it look like? etc,) What are the most important attributes or characteristics?

How can the topic be classified? (For example, a robin can be classified as a type of bird.)

A _____ is a type of _____. It is made up of _____ and looks like _____. Some _____ have _____ such as _____. For example, _____. _____ has several characteristics. One characteristic is _____. Another is ___, which is important because _____.

2. Problem and Solution

-The author states a problem and lists one or more possible solutions to the problem.

-May also include the pros and cons for the solutions.

Problem is… Dilemma is… Puzzle is… Solved Question, Answer, Because, Since, This led to, The main difficulty is, One possible solution is… One challenge… Therefore, This led to, so that, If…then, thus

Fishbone

GO Used: Problem → Solutions

A problem or difficulty can be shown by using question mark!

What is the problem(s)? Who had the problem? What is causing the problem? Why is this problem? What is wrong and how can it be taken care of? What solutions are recommended or attempted? What can be improved, changed, fixed, or remedied? What are the pros and cons of the solutions offered?

_____ had/is a problem because _____. One possible solution is _____. This answer is good because _____. Therefore, _____. As a result, _____. The problem of _____ really boils down to the issue of _____. In the past, the common solution was to_____. However, this was only effective in terms of

_____. Now other solutions might work. One option would be to _____.

3. Cause and Effect

What is the general purpose of the writer? The author lists one or more causes or events and the resulting consequences or effects.

Effect = What happened?

Cause = What made it happen?

Purpose is to explain why or how something happened, exists, or works.

Often there will be an "if/then" pattern

Reasons why, reasons for, if…then , as a result of, therefore, because of, so , since, in order to, leads or leads to, causes, effects of, caused by, result, resulted in, outcome impact, influenced by, brought about by

GO used

What happened?

Why did it happen? What was the reason for…? What was the effect(s) of the event? What happened as a result of….? What were the results or outcomes caused by the event? In what ways did prior event(s) cause or influence the main event? Will this result always happen from these causes?

The reason why _____ happened was because of _____. If _____ hadn't happened, then _____. Due to _____ occurring, _____. This explains why _____. The cause of _____ is not easy to define. Some people think the cause is _____. Others believe the main cause is _____. Understanding the cause of _____ is important because _____.

The effects of _____ are significant because _____. One effect of _____ is _____. Another result is _____. Because of these outcomes, it important that _____.

4. Compare and Contrast

The author explains how two or more things are alike and/or how they are different.

Differs from, similar to, in contrast, alike, same as, as well as, on the other hand, both, either , or not only, but also , yet, although, but, However

-We can also look for comparative adjectives "- est" words: best, fewest, tallest, etc.

GO used: Venn diagram

T-Chart

What items are being compared? What is it about them that is being compared? What characteristics of items form the basis of the comparison? What characteristics do they have in common; how are these items alike? In what way are these items different/ similar?

_____ and _____ are alike in several ways. Both _____ and _____ have similar _____. Both also _____ as well as _____. On the other hand, one way they differ is _____. Another difference is _____. Although they share _____, only ____ is the _____-est.

26. Sequence

The author lists items or events in numerical or chronological order.

Describes the order of events or how to do or make something. Instructions and processes on how to carry out experiments are included under this text type.

First, second, third, next, then, after, before, prior to, not long, after a while, meanwhile, simultaneously, at the same time, following, finally, at last, in the end, on (date) at (time)

Directions

Timeline 1→ 2→ 3 → 4 → 5

Steps/Directions

Cycle/Circle

What sequence of events is being described? What are the major events or incidents that occur? What are the steps, directions, or procedures to follow? (What must be done first, second, etc.?) What is the beginning event? What other events or steps are included? What is the final outcome, event, or step?

Here is how a _____ is made. First, _____. Next, _____. Then, _____. Finally, _____.

On (date) _____ happened. Prior to that _____ was _____. Then _____. After that _____. In the end, _____.

Appendix H: Activities/Lessons for Experimental Intervention

Time Allocated to each Lesson 2hrs per lesson

Purpose: To teach text structure awareness

Place: Bokoji Preparatory School, Room 13 and 14

Participant Co-researchers:

Ato Fidel Dejene(Physics teacher)

Ato Dejene Anbesa(Engish Teacher)

Ato Endale Nigussie(Teacher and Researcher)

Participant: Bokoji Preparatory School Grade 11 Natural Science Students in the 2007 Academic Year

Objectives:

To read using metacognitive strategies

To identify text structure type and its basic features

To identify the main ideas in each text type

To complete comprehension questions

Procedures/Steps during the provision of the lesson:

Lesson Two

Description Text 1of 2

Topic: Electric Current

Pre-reading Activities

What is electric current? How do you describe its characteristics from your previous knowledge and personal experience?

Can you guess what you are going to learn from reading this text? List your ideas and compare with that of your partner.

Skim the text shortly and guess what the purpose of the writer is writing the text.

Highlight the part of the text that may help you to guess the type of text structure used to develop the paragraph.

What questions do you think you are going to be asked?

An electric current is flow of charge. If you compare an electric current with water, a small current is like a trickle passing through a pipe; a really large current is like a river in flood. The rate flow of electric charge-that is, the electric current is measured in amperes (A). The ampere is one of the fundamental units of the SI system. This means that the size of the ampere is not fixed in terms of other units: we simply compare currents to a standard ampere. An ampere is quite a sizable flow of charge, especially in electronic circuits, so we also often deal in mill amperes (mA, 10^{-3}) or even microamperes (μA, 10^{-6})

Section One.

Read the short text below and answer the questions that follow.

1. According to the text electric current is:

A) a flow of charge B)a rate of flow of electric charge C) a sizeable flow of charge D) A and B

2. A ‘trickle’ of water in a pipe is analogous to:

A) Ampere B) large amount of current C) small amount of current D) standard unit of current

3. What is the SI system unit of current as stated in the text?

A) Amperes B) milliamperes C) microamperes D) All are correct answers

4. For what purpose do you think milliamperes or even microamperes are often dealt with?

A) to measure a sizable flow of charge C)to detect electronic circuits

B) to measure small flow of charge D) Only B and C are correct answers

5. The ampere is one of the fundamental units of the SI system. This because:

A) its size is not fixed in terms of other units B) we simply compare current to a 'standard ampere'. C) An ampere is insignificant amount of current D) A and B are answers

6. The purpose of this text writer is to: A) compare current with water B) describe electric current and ampere C) express the cause-effect relation between current and ampere

D) Sequence procedures in measuring current

7. Which one of the following sentences is true according to the information contained in the text?

A) Electric current and water are alike B) mA and μA are not part of 'standard ampere'.

C) The ampere depends on other SI system units. D) The amount of electric current in electronic circuit is small.

8. ' Trickle' in line_____means:A) flow B)drop C)flood D)fluid

9. 'Sizeable' in line____means: A)large B)small C)undetermined D)negligible

10. This text is typical example of_____text structure type.

A) Description B) Causation C) Comparison/contrast D) Enumeration and classification

11. What expression/word and text feature can be used to tell the type of the this text structure?

A) the verb compare

B) the adjectives and determiners small, large, fundamental, fixed, other, sizeable etc

C) the prepositions like, of , in D) the phrases this means, that is, in terms of

E) the conjunctions if, that, so F) the adverbs quite, even, often

Section 2: Complete the following short text extracted from the information contained in the text above.

What makes_____comparable or analogous with_____is_____._____is measured in its SI system unit known as_____._____ is an electric current. Since an ampere is_____its size_____. This means, current is simply compared to_____._____and_____are also used to measure currents in electronic circuits.

What graphic organizer can be used to summarize the information contained in the text above?

Lesson Two

Description Text 2 of 2

Topic: Electric Properties of Materials

Pre-reading Activities

Do you think materials have the same quality of allowing current flow? If no, what makes them different?

Can you think of how the words conductivity, resistivity and resistance are used or/and different? Discuss on the possible answers with your friend.

What do you think you can learn from the text before you read it? Please write your predictions.

Skim the text and decide the type text structure used in the text. Compare it with your partner's and try to reach consensus by presenting the feature of language used to achieve that purpose.

Different materials have different number of conduction electrons. Conductivity is a way of measuring a material's ability to allow an electric current to flow. It is given the symbol δ and its units are Siemens per meter(S/m). The inverse of conductivity is resistivity. It is a measure of how much a material resists the flow of an electric current. It is given the symbol φ and its units are ohmmeter (Ωm). A material with a high conductivity will have a low resistivity and a material with a high resistivity will have a low conductivity. Resistance is a property of a material that controls the amount of current that flows through it. It is measured in ohms.

1. The writer of this text aims to:

A) List different conduction electrons B) Describe conduction features of materials

C) Discuss the difference among the electrical properties of materials

D) Classify and enumerate different materials

2. Which one of the following is the common feature to all the electrical properties in the text?

A) Unit B) symbol C) electric flow D) ohms

3. Of the following pairs of material property, which alternative indicates the opposite ones?

A) Conductivity and resistivity

B) Conductivity and resistance

C) Resistivity and resistance

D) None

4. In which of the following chains of material properties are correctly matched with their symbol, unit, and function respectively?

A) Resistivity-p, Ωm, resists current flow B) Conductivity- , S/m, allows current flow

C) Resistance-Ω, ohms, controls current flow D) All are correct answers.

5. 'It' in the second line refers to:

A) conductivity B) electric current C) symbol D) Siemens

6. Which one of the following alternatives does not contain information that cannot be inferred from the above text?

A) All materials have all the electrical properties stated in the text

B) The number of conduction electrons determines material property

C) Mica and plastics have high resistivity D) Semi-conductors have the least conductivity

7. The dominant feature of the text organization is:

A) Description B) comparison/contrast C) enumeration D) causation

8. As conductivity is to the movement of charge, so is resistance to:

A) Movement B) amount C) direction D) control

9. What feature in the text can assist you to identify the text type above?

10. Summarize the above text in your own words.

11. What GO can be used to summarize the text? Show it.

Lesson Three

Problem-solution Text 1 of 2

Topic: Incomplete Circuits

Pre-reading Activity

What do you know about incomplete circuits? Are they functional or not? Discuss with your friends.

What do you anticipate to learn from reading this text?

Skim the text shortly and then:

-Think about its content, text structure, distinctive features

-List task expectations and plan how you should approach it for a better understanding

We know that because of a gap in an electric circuit, the circuit will be incomplete and in effect there will be no current flow. However, there is a possibility when such circuits may still be functional. But how could this be so? If we connect two large metal plates in a circuit with an air gap between them, and a power supply is connected, the electric field created in the conducting wires causes electrons to flow towards the positive terminal. Since the electrons cannot cross the gap between the plates, they build up on the plate connected to the negative terminal, which becomes negatively charged. Electrons in the plate connected to the positive terminal flow towards the positive terminal, resulting in a positive charge on the plate. The attraction between the opposite charges across the gap creates an electrical field between the plates which increases until the potential difference across the plate is equal to the potential difference of the power supply.

Section one: Answer the following questions based on the above text.

1. When does a circuit become incomplete?

A. When it is not functional C. When there is a gap in it

B. When there is a current flow in it D. All

2. What happens because of incomplete circuits?

A. Gap/empty space is created in it C) The circuit becomes non-functional

B. Current does not flow in it D) B and C are correct answers.

2. Can an incomplete circuit be functional?

A. Yes B) No C) Cannot be determined D) Not stated in the text

3. Why do you think we need to large metal plates in the circuit as discussed in the text? We need them in order to:

A. Fill in the gap B) block flow of current C) Collect charges onto them D. Create electric field

4. A power supply is connected to a circuit for one of the following purposes indicated. Which one is it?

A. To create electric field within the circuit B. To enforce electrons to move through the circuit

C. To make the circuit complete filling the gap D. A and B

5. How can the electrons on the plate terminals make the flow of charge possible? Because:

A. The plates are in contact

B. The charges on the plates are similar

C. The charges on the plates are opposite

D. The plates emit high electric field

6. How long can an incomplete circuit stay functional according to the text?

A. As far as the plates stay B. As long as the p.d supply is greater than that across the circuit

C. For unlimited period of time D. As long as the p.d supply kept increasing

7. Why do the electrons build up on the metal plates? It is because they:

A) Repel each other B) they attract each other C) cannot move in reverse position D) cannot escape the gap

8. According to the text, which one is true about incomplete circuits?

A. There can be flow of current in it. B. There can never be a flow of current in it.

C. Potential difference is not needed to move electrons in it D. The gap between the plates limits electron flow.

9. The main purpose of the writer is to:

A. Describe what an incomplete circuit is B. Present process sequence in circuitry electron flow C. Discuss how incomplete circuits can be functional D. Compare and contrast incomplete circuits with incomplete ones

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section 2: Answer the following questions as required.

a. What clues there in the text can be used to tell its text type?

b. Can you think of a GO that can best summarize the important information in the text?

c. Complete the short extract below based on the information in the text.

It is_____that_____circuits can be made_____by using_____and enforcing_____to_____on each terminals whereby_____are able to_____the gap due to_____between_____and_____charges as long as the _____across the plate_____

Lesson Four

Problem-solution Text 2 of 2

Topic: Electric Charges

Pre-reading Activity

What do you know about opposite and similar charges?

Do you think we can pull similar charges together? Discuss with your partner.

Tell your friend the distinctive features of each type of text structure and guess what the following text type could be looking at the title.

Skim the text and then:

Write what the text is about and what you think you can learn from reading it.

Plan how you should approach the text for deeper understanding.

Similar charges will always repel each other. But will it be possible to bring these charges, for instance, two positive charges closer to each other. This is definitely possible. However, in order to so work has to be done. What does that exactly mean? Well, if you push a small positive charged sphere closer to a larger one with the same charge sign, it will gain in electrical potential energy and due to this, if you let it go, this energy will be changed into kinetic energy as the smaller sphere rushes away. The electric field around the larger field exerts repulsive force on the smaller one. This means, the closer the smaller sphere to the larger one, the greater the amount of work that needs to be done and so the higher the potential.

Section one: Choose the alternative with the correct answer based on the information contained in the above paragraph.

1. According to the text, is it possible to bring similar charges together?

A. Yes B) No C) cannot be determined

2. Which of the following sentences is false according to the text?

A) Opposite charges will always repel each other. B) It impossible to bring similar charges together C) electrical potential energy change into kinetic energy is impossible D) All

3. Why does the small sphere rushes away? Because it:

A. is repulsed by the larger sphere C) acted upon external electric field

B. it gains kinetic energy D) A and B are answers

3. The further the smaller sphere is brought closer to the larger sphere:

A. The kinetic energy of the smaller sphere increases B. The distance the smaller sphere rushes away increases C. It is obvious a lot of work must have been done on it. D. All

4. Of the following list of words/expressions the one that show the distinctive features that can help us tell text structure type are:

A. but, though C) this means, for instance

B. so, for instance, if…will, due to D) possible, question, in order to

5. This text structure type seems to be:

A. Causative B) Enumeration C) Compare contrast D) Problem-solution

10. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section Two: Answer the following short questions based on the information in the text.

a. How much do you think you achieved on your approach /strategy use, content prediction and earned understanding?

b. Can you think of an appropriate GO to summarize the text with? Discuss and decide with you partner.

c. Summarize the most important points in your own words.

Lesson Five

Cause-effect/Causative Text 1 of 2

Topic: How are Electric Currents Formed?

Pre-reading Activity

How do you think currents are formed in a conducting material?

How are charges and current different?

How do you anticipate learning from the text? Share with your friends.

Skim the text and

Write task expectations, text structure type, and the purpose of the writer

Plan how you should approach the text.

An electric field can cause charged particles to move. Indeed, this is why a current flows through a circuit. An electric field is set up within a conducting material and this causes electrons to feel a force and thus move through the wire and components of the circuit. Where there is a gap in a circuit, although the effect of the electric field can be felt by the charges across the empty space, conduction electrons are generally unable to escape their conduction and more across the gap. This is why a complete path is needed for a simple electric circuit to function.

Section one: Choose the alternative with the correct answer based on the information contained in the above paragraph.

1. Which one of the following sentences is correct based on the information in the text?

A. The charges across the space in a circuit with a gap feel no electric field

B. A circuit may still be functional with incomplete path in it.

C. Despite an incomplete path in a circuit, the charges in it may be influences

D. A moving charged particles are different from current

2. Charged particles in a conducting metal move because of the effect of:

A. Current B. Electric field C. Conduction D. Circuit

3. According to the text why does a current flow through a circuit? It is because:

A. Charged particles are made to move by electric field

B. The circuit has conduction electrons within its components

C. There is no gap or empty space within circuit's path D. The effect of electric field can be felt by electrons

4. The charged particles are:

A. Conduction electrons B. Moving electrons C. Electric field and current D. A and B

5. When do conduction electrons cannot escape their conduction?

A. When there is no gap/empty space in a circuit B. When the circuit is incomplete within its path C. When the circuit is not easy to function D. All

6. What do you think will happen if some electrons could jump across the gap?

A. The circuit becomes complete. B. The circuit remains incomplete

C. There will be flow of current D. All

7. If electric field is not set in a conducting material, then:

A) There will be current flow. C) Electrons move within the material.

B) Electrons will feel force. D) The particles therein remain neutral.

8. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section two: Answer the following short questions on the text you have read.

a. What type of text structure did the writer use in the above text? What clue or expression can you use in the identification of the text type?

b. Which expressions in the text the following categories of words/phrases can replace?

*For this reason, due to this cause/reason, as a result, as a consequence, because of this, in effect

*makes, enforces, leads to, results in

*hence, therefore consequently, in effect, due to this reason

c. What do you think of a possible title of the text? Discuss and determine with your friend.

d. What type of GO can be used to summarize the important information in the text?

c. Complete the following text extracted from the short text you have read on your own.

_____flows through_____, because the _____set up within conducting material _____electrons to _____and _____the wire and the components of the_____. When a circuit is____ or when there is ____or _____electrons cannot escape_____. Therefore, _____is required for an electric circuit to_____.

Lesson Six

Cause effect/Causative Text 2 of 2

Topic: Electric Dipole

Pre-reading Activity

What do you think the separation of charges is? Discuss with your partner

What is the meaning of the prefix ‘di’? Scan for it.

Skim the text and then:Guess what it is all about.

Think of the type of text structure used.

Plan how you should approach it while brainstorming for the features of each text type.

An electric dipole is created as a result of separation of positive and negative charges. This often happens at a molecular level and hence leads to molecular dipoles. A single atom may have its cloud of electrons moved slightly in one direction due to an external electric field. This leads to a separation of the charge (positive nucleus and the negative electrons).When a dipole is placed inside an electric field, equal and opposite forces act on the charges in the dipole. This causes a turning effect and so the dipole orientates itself with the electric field.

Section one: Answer the following multiple choice questions based on the short text you have read.

1. The electric dipole is created due to:

A. integration positive and negative charges

B. separation of positive and negative charges

C. leading molecular dipoles

D. external electric field

2. What directly happens as a result of placing a dipole inside an electric dipole?

A. The dipole orientates itself with the electric field

B. The charges in the dipole will be affected by equal and opposite forces

C. The nucleus will split and emit radioactive particles

D. Other dipoles are created at a molecular levels

3. What causes electrons to slightly move in one direction?

A. Magnetic field B) electric field C)mechanical work D) electron cloud

4. What is the level at which dipoles are created?

A. Atomic B) molecular C) chemical D) particle

5. Which one of the following is not true according to the information discussed in the text?

A. Separation of charges at molecular level results in creation of molecular dipoles.

B. Separation of the charger involves both negative and positive charges to create dipoles

C. The dipole orientates itself with the electric field due to the turning effect

D. What move slightly in one direction are both the atom and its cloud of electrons

6. In which one of text structure type is the text you have read categorized?

A. Causative B) comparison C) problem-solution D) enumeration

7. The correct order of the processes in the formation of dipoles is:

A. external in electric field→moving of electrons in one direction →separation of charges→ formation of dipoles→turning effect on the dipoles→orientation of the dipoles with electric field

B. separation of charges→formation of dipoles→external electric field →turning effect on the dipoles→ moving of electrons in one direction→ orientation of the dipoles with electric field

C. turning effect on the dipoles→external electric field→orientation of the dipoles with electric field→moving of electrons in one direction →formation of dipoles→ separation of charges

D. Moving of electrons in one direction→separation of charges→external electricf→ield orientation of the dipoles with electric field →turning effect on the dipoles→ formation of dipoles

8. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series(vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section 2: Answer the following short questions on the above text.

a. What is the text structure type of the above text?

b. Identify the topic sentence of the text. Justify your answer with evidence while discussing with your partner.

c. What clues or language style in the text can be used in the identification of the text type?

d. Think of an appropriate GO to summarize the text. Discuss with your partner to decide on the most appropriate one.

e. Can you summarize the text what the text is all about in a sentence or two? Compare it with that of you friend.

d. Complete the short text below with relevant information from the text. Note that only the information from the text is required.

The____of_____which happens at_____level is the cause for the____of___. _____forces_____to move in one direction and hence the _____separate. Because____and____forces act on the____in____. Due to these forces____is created and in turn_____orientates itself with____

Lesson Seven

Comparison Text 1 of 2

Topic: Electrical and gravitational fields

Pre-reading Activities

How similar do you think gravitational and electrical fields? How different are they? List some characteristic of both and discuss over it with you friend.

How do you expect to learn from this text? List your ideas.

What do you think the purpose of the writer is in writing this text? How about the structure type used?

How do you think you should approach the text for a better understanding?

Skim the text and back up your predictions or think of an alternative approach while guessing what questions are to be asked in the activities.

Electric and gravitational fields have a lot in common. The expressions for the forces and fields point sources take the same form, obeying inverse square laws. Expressions for the potentials due to point charges also take the same form, both proportional to Coulomb's Law for the force between point charges, Newton's Law of Gravitational force between spherically symmetrical masses, electrical field due to point charge, gravitational field due to spherically symmetrical mass, electrical potential due to point charge, and gravitational potential due to a spherically symmetrical mass. There are some differences, however. The force of gravity is much weaker than electrical force. Additionally, the force of gravity is always attractive-there is only a positive mass, but there are positive and negative electric forces so electrical forces can be repulsive or attractive. Inside a charged conductor, the electric field is zero, whereas inside a spherical symmetrical mass, the gravitational field will not be zero, rather it will take the form of one (1).

Section one: Choose the alternative with the correct answer based on the information contained in the above paragraph.

1. Obeying inverse square laws is:

A. What makes electrical and gravitational fields different from each

B. What makes electrical and gravitational fields the same

C. The law of how to calculate the relationship between electrical and gravitational fields

D. How to understand the effect of gravitational field on electrical fields.

2. One of the following is not a common characteristic to both gravitational and electrical fields.

A. They have similar expressions for the forces and fields point.

B. They have forces of equal magnitude

C. The gravitational field around a spherically symmetric mass and electric field inside a charged conductor are equal.

D. Their forces are both repulsive and attractive.

3. According to the text, gravitational and electric field forces:

A. Have more similarities than differences

B. Are almost the same

C. Have little differences

D. Are entirely different or incomparable

4. The number of similarities between gravitational and electrical field number to:

A. 1 B. 2 C. 3 D. 4

5. The number of differences between electrical and gravitational fields are:

A. 1 B. 2 C. 3 D. 4

6. How does the writer develop his ideas?

A. By compressing smaller entities into larger classes

B. By expanding conceptual units in details

C. By listing characteristics of the issues discussed

D. By definition and exemplification

7. One of the following cannot be the focus of comparison between gravitational and electrical fields. Which one is it?

A) Newton B) field C) Potential D) None

8. The above text structure is more of:

A. Causative B) Comparison C) Enumeration D) Description

9. The “a lot in common” can be substituted by:

A. Many similarities B) are irrelevant C) different D) A and B

10. The most frequently used punctuation mark in the text is:

A. Period B) comma C) colon D) semi-colon

11. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and ‘√’

Section two: Answer the following short questions based on the above reading text.

a. What is the purpose of the writer?

b. What features can be used to judge the structure of the text?

c. What GO can be used to summarize the most important information in the text?

Lesson Eight

Comparison Text 2 of 2

Topic: Direct and Alternating Currents

Pre-reading Activities

Can you recall the basic features which help us to identify text structure types? Share it to your friend.

Jot down what you think you will achieve after reading this text.

Skim the text and justify your argument by evidence on what it is all about and what type of text structure is used with your friend.

Think about what you may be required of to answer and plan for effective reading strategy.

Direct and alternating currents are different in some ways. Direct current (d.c) has a constant value. It is a type of current that is obtained from cells. Alternating current (a.c), on the other hand, is constantly varying unlike the direct current. It is a type of current that is transmitted from power stations to individual consumers and industrial plants. If you were to look at alternating current on an oscilloscope screen, it would have a sinusoidal wave form. In contrast, if you were to look at d.c current on an oscilloscope screen, it would take the form of straight horizontal line.

Section one: Choose the correct answer for the following questions based on the above short reading text.

1. The type of text structure of the text is:

A. enumeration/listing B. classification C. causation D. compare and contrast

2. One of the following is expression/word can be used to identify the type of text in the above short text. Which one is it?

A. In contrast B. on the other hand C. alike D. all

3. Which type of current discussed in the text do you think is larger in amount than the other is? A. a.c B d.c C) they are equal D) cannot be determined

4. The text is mainly about:

A. the differences between the current types B. the similarities between the current types

C. the differences and similarities of the current types D) None of the above

5. Of the following given options one indicates concepts mismatched in contrast to the information in the text. Which one is it?

A. d.c-constant value-straight line view-cell

B. a.c-constant value-sinusoidal- wave view-power stations

C. a.c- varying value- straight line view-power stations

D. d.c-constant-sinusoidal view-cell

6. Why do you think it is necessary to view currents on oscilloscope screen?

A. to measure their amount B. to test their direction of flow C. to understand the nature of their flow D. to understand their variations

7. Of the types of the currents which is used to run electronic circuits?

A) Direct current B) Alternating current C) Both

8. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section two: Answer the following short questions based on the short text above.

a. What GO can be used to tell the type of structure in the above text?

b. Discuss with your partner the basic features of the text.

c. Summarize the text in your own words.

d. Complete the short extract below based on the information contained in the text.

e. Write three multiple questions on the text you have read and exchange with your friend for evaluation.

f. Identify the text structure type and back it up with textual features as evidence.

g. Summarize the text in your own words.

h. What GO can be used to summarize the text?

Lesson Nine

Process/Sequencing Text 1 of 2

Topic: Millikan's Oil Experiment

Pre-reading Activity

By looking at the title of the text can you predict what it is all about and what type of text structure it employs?

Skim the passage and then:

Write what it is about in general terms. Compare it to that of your partner and choose the one you agree on.

Underline/highlight/encircle any language style or expression that may assist in the identification of the text type.

The basic essence of Millikan's experiment was its simplicity. The weight of a charged particle droplet of oil is balanced by the force from a uniform electric field so that the oil drop remains stationary. Using his apparatus, he undertook variations, one in which there

was no field and the downward terminal velocity of the oil drop was measured and another in which the field was adjusted to provide a stronger force than gravity and the terminal velocity upwards was measured. When oil is squirted into the upper chamber of the apparatus from the vaporizer, friction gives the droplets an electrostatic charge. This will be some unknown multiple of the charge on an electron because electrons have been added or removed due to the friction. As the droplets fall under gravity, some will go through the anode and enter the uniform field created between the charged plates. If the field is switched off, they will continue to fall at their terminal velocity.

Section one: Choose the correct answer depending upon the information given in the text.

1. How are the oil droplets in the experiment made to be stationary?
   A. By equalizing their weight to electric field force strength
   B. By making electric field uniform within the apparatus
   C. No action is actually needed, as they are obviously weightless.
   D. There is no any means discussed in the text.
2. The variation processes Millikan carried out to measure the droplets' terminal velocity are: A) 1 B) 3 C) 4 D) 5
3. Why do you think stronger field than that of gravity needed to measure terminal velocity upwards? It is to:
   A. Make the oil droplets weightless
   B. Enable oil droplet escape gravitational force
   C. Minimize the effect of gravitational force over the electric field
   D. Enforce the oil droplets stay motionless\
4. In the absence electric field:

   A) There is no gravitational force either. B) Upward terminal velocity of the oil droplets is measured. C) The oil droplets will move downward toward gravity. D) The oil droplets will remain motionless

5. As one can understand from the text:

   A. No gravitational force is needed to measure terminal velocity.

   B. Switching of the electric field may not affect the oil droplets.

   C. It is required that the mass of the electrons be smaller.

   D. Oil droplets can be charged or made to move against the force of gravity.

6. When does the first effect of friction observed over the oil droplets?

   A. When the oil droplets move downward in electric field.

   B. When the droplets remain static in the fields due to effect of gravitational force.

   C. When the oil droplets are squirted into the upper chamber of the vaporizer.

   D. When electric field is switched off.

7. The oil droplets posses' electrostatic charge due to the action of:

   A. the charged plates

B. friction in the vaporizer

C. intense gravitational force

D. switching of the electric field

8. The charge on the oil droplets will be the some unknown multiple of charge on electrons since:

A. Electrons either removed or added to the oil droplets due to friction

B. Some electrons will go through the anode

C. Electrons enter a uniform field between the charged plates.

D. The oil droplets fall under gravitational force

9. Why is the experiment needed to be carried out?

A. To measure the mass of the oil droplets

B. To determine the charge on a single electron.

C. To test the effect of gravity and electric field on the oil droplets

D. To find out gravitational and electric field difference

10. The correct order of the main processes in the experiment is:

A. Making the oil droplets stationary→ measuring their terminal velocity→ squirting oil into the vaporizer→ removing/gaining of electrons→ varying electric field strength

B. Squirting of the oil into the vaporizer→ removing/gaining of electrons→ making the oil droplets stationary→ varying electric field strength→ measuring terminal velocity

C. Varying electric field strength→ measuring their terminal velocity→ squirting of the oil into the vaporizer→ making the oil droplets stationary →removing/gaining of electrons

D. Measuring their terminal velocity→ squirting of the oil into the vaporizer →removing/gaining of electrons →varying electric field strength→ measuring their terminal velocity

11. The main purpose of the writer is to:

A. Describe how charge on an electron is determined

B). Compare and contrast electric and gravitational fields

C. Express the cause-effect relationship between friction and oil droplets

D. Classify different velocities with examples

12. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section 2: Answer the short questions below on your own and with your friend.

What type of GO can be used to best summarize the text?

What expression or word or any kind cue can be used to tell the above text type?

What text type is the above text? Discuss with your friend.

Summarize the most important information in the text in your own words.

Lesson 10

Sequencing Text 2 of 2

Topic: Investigating an Induced E.M.F

Pre-reading Activities

What do you think an *induced e.m.f* is? Discuss with your friend after you have brainstormed for some ideas. Scan for it in the text and test your guess.

Can you guess what will be the main content of the text and its structure type from the topic?

Skim the text and discuss on what is generally about and see if your prediction on its content and text structure type is correct.

Underline the most prominent language features in the text that may help to identify the text structure. Plan on how you should approach the text before you read for further meaning.

Demonstrating an induced e.m.f and investigating factors that influence its magnitude is possible in simple experimental method. You need a galvanometer, two bars of magnets and a piece of wire of which ends are to be connected to the galvanometer. After you have connected the wire to the galvanometer, move it between the magnets. Then while moving the wire, observe what happens to the needle on the galvanometer. Now also investigate what happens to the size of the induced e.m.f when you vary the conditions of the experiment. Try changing the strength of the magnetic field. Again try moving the wire through the magnetic field at different speeds. How do these variations affect the induced e.m.f? Now make a coil of another wire, insert it in the circuit and move it through the magnetic field. How does this affect the induced e.m.f?

Section one: Answer the following multiple choice questions on the text above.

The magnitude of the induced e.m.f possibly depends on: A)The strength of the magnetic field B) The speed at which the wire is moved through the magnetic field C) Additional influence made by the coil on the circuit D) All

How many separate items are needed to carry out the experiment?

2 B) 3 C) 4 D) 5

As it can be understood from the text, the number of major procedures or steps carried out to perform the experiment is:

A) 4 B) 5 C) 6 D) 7

4. How many steps of procedures are needed to be carried out in the investigation of the size of the induced e.m.f while varying the experimental condition?

A. 4 B) 3 C) 5 D) 7

5. Which one of the following statements can be made from the information we find in the text?

A. A stronger magnetic field means a larger e.m.f. B. Greater speed of moving the wire means greater e.m.f. C. Coiling of wire in the circuit means larger e.m.f. D. All are answers,

6. How many factors affect the induced e.m.f as discussed in the text?

A) 4 B) 3 C) 2 D)

7. The type of structure employed in the above text is:

A. process description/sequencing

B. Cause-effect

C. Enumeration/Listing

D. Description

8. The experimental process involved here can be referred to as:

A) Difficult B) single C) moderate D) complex

10. The correct order of the processes to carry out the experiment is:

A. Preparing the bar magnets moving the galvanometer between the magnets varying magnetic field strength varying the speed of moving the wire inserting into and moving the coil in the circuit

B. Connecting the wire to the galvanometer moving the wire between the magnets varying magnetic field strength inserting into and moving the coil in the circuit

C. Varying magnetic field strength varying the speed of moving the wire inserting into and moving the coil in the circuit connecting the wire to the galvanometer moving the galvanometer between the magnets

D. None

11. Which of the following categories of graphic organizers can best summarize the main information in the text?

A. Equal number of horizontal and connected boxes/table/graph/pie-chart/pictures of different sizes, colors and shapes

B. Time series (vertical or horizontal line arrows)/circles/ one direction arrowed boxes/parallel or vertical segment connected boxes

C. Conceptual/mind maps/tree-diagrams/pie-charts/tables

D. Parallel or vertical boxes of equal or different numbers/multiple arrows/forks/fish bone

E. Connected boxes with questions marks/question marks and blank spaces/table headings with questions and '√'

Section 2: Answer the following short questions based on the short text you have read.

Why is the experiment needed to be carried out?

How can we investigate the factors that affect the induced e.m.f?

Why is varying some conditions necessary in the experiment?

What kind of GO can be used to summarize the most important points in the text?

Can you sketch how the circuit looks like? Think about it and decide on what it? should be like?

Appendix I: Pilot Study Data

Reliability= 0.65

Text Type						
Student ID	Description	Problem/ Solution	Causative	Comparison	Sequencing	Total
1	3	4	5	5	5	22
2	3	5	5	5	6	24
3	3	4	5	5	5	22
4	3	4	3	6	5	21
5	5	6	5	5	4	25
6	5	6	6	5	7	29
7	5	4	6	5	7	27
8	6	6	7	7	8	34
9	4	5	5	5	6	25
10	3	4	4	4	5	20
11	5	7	7	7	7	33
12	4	4	4	6	7	25
13	5	5	7	5	7	29
14	2	5	5	3	5	20
15	5	4	5	5	6	25

Appendix J: Pretest and Posttest Students' Reading Comprehension Scores

Student ID	Experimental per Text Type and Total Score												Control Group per Text Type and Total Score											
	Description		Problem/sol		Causative		Comparison		Sequencing		Total		Description		Problem/sol		Causative		Comparison		Sequencing		total	
	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST	PRT	PST
1	4	5	4	6	5	6	4	6	5	7	22	31	3	3	3	4	4	4	5	5	5	6	21	24
2	3	5	3	6	6	7	6	7	6	7	24	33	4	4	4	4	5	5	5	5	6	6	24	28
3	3	5	3	6	4	7	5	6	6	8	21	32	3	4	3	4	5	5	6	6	6	6	23	27
4	4	5	4	6	5	6	6	7	5	7	24	34	4	3	4	4	5	4	5	5	5	5	23	23
5	4	6	4	6	4	7	5	7	6	8	23	32	3	3	3	4	5	5	5	5	6	5	25	21
6	3	6	3	7	5	7	5	8	7	7	23	33	3	3	4	4	5	4	5	5	5	5	23	22.
7	4	6	4	7	5	8	6	7	6	9	25	34	4	3	4	4	5	4	5	5	5	5	25	23.
8	3	5	3	6	5	7	6	7	6	8	23	32	4	3	4	5	5	6	6	5	6	6	26	25
9	4	7	4	7	5	7	5	7	7	8	25	36	4	4	5	4	4	4	5	5	6	5	21	26
10	4	6	4	6	5	7	6	8	7	7	26	35	3	3	3	5	4	4	5	5	5	6	24	25
11	3	5	3	5	5	5	5	7	5	7	21	30	3	3	3	4	4	4	5	6	6	7	24	20
12	3	5	5	5	5	7	5	7	6	8	24	33	4	3	4	3	4	5	4	5	5	6	25	23.
13	4	5	3	6	4	6	6	7	6	7	24	34	3	3	3	4	4	4	5	5	6	6	27	20
14	5	6	3	6	5	7	6	7	6	7	25	35	4	4	4	4	6	4	6	5	6	6	22	27
15	4	6	5	6	6	7	6	8	7	7	27	37	4	4	5	5	6	6	6	5	6	6	20	28
16	3	5	4	5	5	6	4	7	6	8	22	31	4	3	4	4	4	4	5	5	6	5	23	24
17	3	5	3	6	4	7	6	8	5	8	20	30	3	3	3	3	5	5	6	5	5	6	27	26
18	4	6	4	6	5	6	5	8	5	7	23	32	4	4	4	5	5	5	6	6	7	6	22	27
19	4	7	4	7	5	7	6	5	6	8	27	36	4	3	3	4	5	5	5	5	5	5	26	22
20	3	5	4	8	5	8	5	7	5	7	22	31	4	4	4	5	5	4	6	6	7	6	19	28
21	4	5	3	5	4	6	6	6	7	8	26	37	3	3	4	4	5	4	6	5	6	5	26	25
22	3	4	3	5	4	6	6	6	6	7	19	29	4	3	3	5	5	5	6	5	7	7	24	25
23	4	6	4	7	4	6	6	8	6	8	26	36	3	4	3	4	5	4	6	5	6	5	28	21
24	4	6	4	6	5	6	5	7	6	8	24	33	3	3	3	4	5	5	6	5	7	7	20	24
25	5	6	4	6	5	7	6	7	6	7	28	39	4	4	4	4	4	5	5	5	6	5	25	22
26	3	6	3	7	4	7	5	8	5	8	20	30	4	4	4	3	4	5	5	5	5	6	21	24
26	4	6	4	4	4	6	6	7	7	8	25	35	5	5	5	4	4	4	5	6	6	6	22	27
28	3	*	3	*	5	*	5	*	5	*	21	*	3	3	4	4	5	5	6	5	6	5	23	26
29	3	6	3	6	5	6	5	7	6	7	22	31	4	3	4	4	5	4	6	5	6	6	28	26
30	4	6	5	5	4	8	5	7	5	7	23	32	4	3	3	4	5	5	6	6	7	6	21	23
31	4	5	5	6	5	6	6	7	6	8	28	38	3	*	3	*	4	*	5	*	5	*	24	*

Appendix K: Randomly Selected Students

ID	Name	Sex	Age	Random Number
1	Abduro	M	17	2
2	Abebu	F	16	3
3	Abraham	M	18	10
4	Ahmed	M	17	12
5	Ahmed	M	17	13
7	Alemu	M	18	14
8	Aliy	M	18	16
9	Amarech	M	16	17
10	Asrat	M	16	21
11	Atlaw	M	18	23
12	Bereket	M	21	31
13	Bereket	M	18	32
14	Biruktayit	F	18	33
14	Biruk TT	M	17	37
16	Daniel U	M	16	44
17	Debele	M	16	45
18	Diriba	M	17	57
19	Diribe	F	17	59
20	Ebsa	M	19	60
21	Elsabet	F	18	62
22	Endale	M	18	65
23	Ephrem	M	17	67
24	Eriste	M	18	68
25	Fanos	F	17	70
26	Fasil	M	19	72
27	Firaol	M	19	73
28	Gadisa	M	18	74
28	Gashaw	M	18	75
29	Genet B	F	17	78
30	Getahun	M	16	83
31	Gishe	M	19	89
32	Gudo	F	93	
33	Guta	M	95	
34	Haji	M	97	
35	Hinsermu	M	100	
36	Hirko	M	101	
37	Hordofa	M	102	
38	Ismael	M	104	
39	Kelid	M	110	
40	Mamo	M	117	
41	Mesresha	M	120	
42	Megersa H	M	122	
43	Mekdes B	F	124	
44	Mekiya	F	125	
45	MekioninT	M	126	
46	Metasebiya	F	130	
47	Mihiret	F	131	
48	Million	M	132	
49	Mohammed	M	133	
50	Nano	M	141	
51	Sancho	M	145	
52	Serkalem	F	147	
53	Shimelis F	M	149	
54	ShimelisD	M	150	
55	Sisay	F	151	
56	Tade	M	155	
57	Tesfaye	M	163	
58	Tesfaye F	M	165	
59	Tizita	F	171	
60	Wesene	F	178	
61	Workina	M	180	
62	Zelalem B	M	184	